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The Purification of Sewage and Water.

GOETHE once said that "the Germans possess the gift of rendering the sciences inaccessible," while "the English are masters of the art of making an immediate use of any new discovery, until it leads once more to further discovery and fresh action." We doubt whether the Germans of the present day will admit the truth of Goethe's dictum, or whether Englishmen are as certain of their superiority now as at the beginning of the nineteenth century; there can, however, be little doubt that in the application of science to the purification of sewage Englishmen still retain the lead. We do not forget that our knowledge of bacteriology owes much to German research, nor that some of the foremost bacteriologists in this country are of German extraction, but we may fairly claim that the new discoveries in this department of science have been put to immediate use by the English, and that this has led "to further discovery and fresh action." The book which lies before us* furnishes an interesting record of the progress which has been made in this country during the last few years in the science of sewage purification. The fact that foul organic matters can be rendered innocuous by natural agencies must have been observed by the first farmer, but successive generations through countless ages never got beyond the simple fact. It was not until the part played by bacteria in this important change had been discovered that the fact became vital and led to further discovery and fresh action with such rapidity that—it is scarcely too much to say—the whole science of sewage treatment has been revolutionised in a single generation. In his preface Mr. Dibdin refers to a paper read by him before the Institution of Civil Engineers in 1887, when a statement as to the possibility of utilising bacteria in the purification of sewage, otherwise than on land, "was met with pronounced scepticism." To-day possibility has become certainty, and even a Royal Commission has passed a favourable judgment on the subject. In 1887 Mr. Dibdin had "not the slightest doubt but that the future treatment of sewage will be a combined chemical and biological one." To-day it is agreed that, for many kinds of sewage, chemical treatment is unnecessary, and that a satisfactory degree of purification can be effected by bacteria alone. That our knowledge is yet incomplete everyone must admit, but there cannot be two opinions as to the value of the discoveries which have already been made and as to some of the practical applications of these discoveries.

Mr. Dibdin's name is associated with the important experiments carried out by him on London sewage; his first report on the subject having been published in 1892, and it is only natural that he should still regard with special favour the method of treatment which he evolved in the course of these experiments. The principal feature of what is sometimes known as the Dibdin system is "the contact bed," a kind of filter in which sewage is retained for a time in contact with the filtering material and then drained off, so that the bed has alternate periods of work and rest, or, to put it another way, alternate doses of sewage and air. The common objection to this method of filtration is that there is a constant reversal of conditions, and that the aerobic bacteria have not the necessary supply of oxygen when the bed is standing full. The percolating, or "trickling," filter has, therefore, many advocates; in this method the sewage is distributed over the surface of the filter in small streams or drops, and drained away at the bottom in such a manner that the body of a filter is never waterlogged. The difficulty in this case is to insure an equal distribution of the sewage and to prevent the choking of the distributors. The relative merits of the two methods of filtration are still keenly discussed, and it is somewhat surprising that Mr. Dibdin does not expressly state his own opinion on this important point. He gives a number of reports in which results obtained by the rival methods are recorded, and leaves the reader to form his own conclusions. From the author's point of view, this method of book-making possesses undoubted advantages, but it is not exactly what the reader, who naturally looks to the expert for guidance, has a right to expect. It is true that Mr. Dibdin, in summarising his experiments on the biological filtration of London sewage, concludes "that the contact of the micro-organisms with the effluent to be purified must be effected by leaving such effluent to rest in the filter for a greater or less time, according to the degree of purification required," and "that after each quantity of effluent has been dealt with, the micro-organisms

* "The Purification of Sewage and Water." By W. J. Dibdin, F.I.C., F.C.S. Third Edition, revised and enlarged. London: The Sanitary Publishing Co., Ltd., 5, Fetter-lane, E.C. 1903.

must be supplied with air, which is readily effected by emptying the filter from below, whereby air is drawn into the interstices." These are the conditions under which sewage was purified by means of contact beds in Mr. Dibdin's London experiments, and we may assume that they were regarded by him as essential at the conclusion of those experiments in 1896; but he would be a bold man who to-day ventured to state so dogmatically that purification of a tank effluent by filtration "*must* be effected by leaving such effluent to *rest* in the filter." The fact that trickling filters have given as good results as contact beds confounds both the "must" and the "rest."

Chapter V. is devoted to the experiments carried out at Sutton (Surrey) under Mr. Dibdin's direction. The first experiments (1894-1896) were on similar lines to those at the London outfall, tank effluents being treated in contact beds; but in 1896 a new departure was made—crude sewage was treated by contact in a primary coarse bed, and the effluent from this was treated in a secondary finer bed. The results of the first two and a half months' work were given in a report by Mr. Dibdin, and led him to make a statement on which great expectations were unfortunately based. "It appears from these results," he wrote, "that a bacteria tank or tanks of an area of half an acre will be sufficient for the complete disposal of the sludge by this system, without any expense for labour other than that necessary for turning on the valves and raking over or digging with a fork the surface of the ballast from time to time as may be required to break up the surface coating of fibrous matter; up to the present time this has been found to be necessary on only two occasions." The sewage at Sutton is entirely domestic, and later experiments have shown that the sewage of many of our large towns cannot be satisfactorily treated by contact beds alone. There must be not only preliminary screening, but also sedimentation, the latter being usually accompanied by an appreciable amount of bacterial action, or the primary bed will sooner or later be rendered almost inoperative by the choking of the surface and of the interstices in the body of the bed. The treatment of crude London sewage by contact beds alone was tried by Mr. Dibdin's successor, and proved a failure, and after exhaustive experiments at Leeds with coke beds "it was found impracticable to deal with crude or partially settled sewage, not because good effluents could not be obtained, but because the capacity of the rough bed could not be maintained; and when accumulations arose, a large part of them, having reached an irreducible stage, could not be consumed by resting the beds." The longest chapter in the book is devoted to the experiments at Leeds, and it is somewhat curious that Mr. Dibdin does not mention the fact that, for the first twelve months (October, 1897, to October, 1898), he was the chemist under whose advice the experiments were carried out.

"The septic tank and other systems" are described in the sixth chapter, in which brief mention is made of Mr. Cameron's work at Exeter and Mr. Scott-Moncrieff's at Ashtead. Seven of the twenty pages of this chapter are devoted to an account of Stoddart's filter, and other filters and sewage distributors are also described. In the next chapter Mr. Dibdin institutes a comparison between land treatment and bacteria beds, and concludes that "the bacterial process worked out at Barking Creek and Sutton is *land treatment*, but concentrated, accelerated, and controlled; whilst land treatment as generally practised is haphazard, uncertain, and expensive." The chapter is, however, too short to be convincing. The well-known experiments at Manchester are described at length in the next chapter, and here, as in the case of the Leeds experiments, Mr. Dibdin does little more than present a condensed version of the report published by the Corporation. Nine pages are devoted to the bacterial treatment of factory refuse, and the following chapter on "screening" is nearly as short as the famous chapter on "Snakes in Iceland"; two plates illustrating John Smith Co.'s self-acting screen and Latham's "solid sewage extractor" are, however, given in connexion with it.

To Londoners the purification of the Thames is a matter of great importance, and Mr. Dibdin's name was for a number of years so intimately associated with the subject that his account of the past and present conditions of the river cannot fail to be of interest. He strongly advocates the adoption of bacterial treatment for the final purification of the sewage effluents at Barking Creek and Crossness, and adds, "I candidly confess that I look forward to the adoption of the coke-breeze bed system, which I worked out at Barking Creek . . . as the coping stone of my life's work in effecting the purification of the Thames."

Chapter XIII., entitled "The Discharge of Sewage into Sea-water," consists almost entirely of extracts from reports by medical men on the connexion between infectious disease and sewage-polluted shell-fish, and Mr. Dibdin is strongly of opinion that the discharge of crude sewage into streams flowing directly over or near oyster, cockle, or mussel beds, or into the sea itself "within a considerable distance of any seaside resort," ought to be absolutely prohibited.

The five following chapters deal with the filtration and systematic examination of potable water, the character of the London water supply, the action of soft water upon lead, and the absorption of atmospheric oxygen by water. Mr. Dibdin's account of the London water supply is very interesting, and every householder would rejoice if some method of softening the water were adopted by the companies. Mr. Dibdin has made experiments on the subject, and believes that the softening process would not only reduce the hardness, but also remove about 25 per cent. of the dissolved organic impurity and 87 per cent. of the bacteria. "It would therefore seem," he says, "that, by the adoption of the system of softening, the present supply, *in respect of its chemical quality and number of bacteria*, would be improved to a degree comparable with that of the Welsh supplies." The words which we have taken the liberty of printing in italics are notable, and may be misleading to the ignorant reader. The *number* of bacteria in a sample of drinking water is of trifling importance in comparison with their *nature*, and one of the principal objections to those London water supplies which are obtained from the Thames is that the bacteria in the river include bacteria derived from sewage and from manured lands, and that some of these are pathogenic. What is required in making a comparison between filtered Thames water and water from the Welsh mountains is not only a quantitative, but also a thorough qualitative, bacteriological examination.

The nineteenth chapter is entitled "Analyses and their Interpretation," and brings us back to the sewage problem. It is followed by "The Ventilation and Deodorisation of Sewers," and a summary of the reports already issued by the Royal Commission on Sewage Disposal. Two appendices, dealing with methods of analysis, are added.

There is still much to be learnt in connexion with sewage treatment, but the short account of Mr. Dibdin's work which we have given will show that he has covered a wide field. He has had great practical experience, and writes, therefore, with authority. By medical officers and engineers his book will be warmly welcomed, and the lay reader interested in municipal affairs will find it well worth perusal. The book is a clearly-printed volume of about 400 pages, and contains about forty illustrations and diagrams, eighty tables, and a good index.

"LEAD ARCHITECTURE."

By Sir George Birdwood, K.C.I.E.

THE direct purpose of the scholarly and inspiring paper on "Lead Architecture" recently read by Mr. Starkie Gardner before the Royal Institute of British Architects was to advocate the larger use of lead, not only in the decoration, but in the construction of buildings, both private and public; but it also, indirectly, suggests a reference to the salient statistical facts of the present position of the production and manufacture of lead in this country, which are full of cautions for all those who are anxious to cast a right and true vote on the great fiscal question now before this country; and to these figures I would desire, very briefly, to call attention; for they deserve the most searching and deliberate consideration.

It is not necessary to go into any ancient, or mediæval, or modern history to show our continuous pre-eminence from the time when, according to Pliny [vii., 56 (57)], "Plumbum* ex Cassiteride primus aportavit Midaeritus" [*i.e.*, the Phœnician "Melkart"], down to the XIXth century in the export of lead and leaden wares. Nearly all the older French churches and palaces were covered in with British lead; and Louis XIV. used "32,000,000 livres" of "English lead" on the roofing of Versailles. The catastrophic decline in the production of

* Plumbum here means "lead," or includes lead. Pliny distinguishing tin ore as "p: candidum" and tin in bars as "stagnum,"—after IVth century A.D. "staonum" [xxxiv., 16, (47)], the *Kassiteres* of Homer, Assyrian *Kazasstira*, Accadian *Kasdura*, and Sanskrit *Kastira*. Compare "Casiter St." Bodmin!

British lead began late in the XIXth century, and during the last thirty years has continued at a rate which seems to threaten its extinction in another decade or two. Thus the production was :—

In 1877	80,850	tons.
„ 1887	52,563	„
„ 1897	35,338	„
„ 1902	24,606	„

For some time previous to this decline the production was not equal to our consumption of lead; but its diminution is not to be traced to any exhaustion of our lead mines, and is to be attributed for the most part to the comparative cheapness with which lead was, and still is, worked in other countries—Spain, United States of America, New South Wales, South Australia. etc.; the total imports of lead ore, pig lead, and sheet lead into the United Kingdom from other countries having amounted in 1902 to 327,244 tons, as against our output, as shown above, of 24,606 tons. In the same year our exports of foreign lead ore, pig lead, and sheet lead amounted to 23,142 tons; and of British lead ore, pig lead, sheet lead, and lead piping and lead tubes—some of which articles were, I presume, manufactured of foreign lead—to 34,987 tons; thus leaving an immense residue for home consumption. The fall in the price of lead is shown in the following figures :—

1873	23*l.*	6	0	per ton.
1883	12*l.*	18	0	„
1893	9*l.*	16	11	„
1902	11*l.*	4	8	„

Now, although our mines are not exhausted, the production of them could not have been raised to the stupendous proportions of the importations of foreign lead; and without the cheapening of lead caused by these foreign importations there would have been no possibility of the extended and in every way highly advantageous use of lead that has been followed in this country during the last thirty years, and no possibility of its yet wider application in architecture as proposed by Mr. Starkie Gardner; or, in other words, of the restoration of lead to its proper place in the architecture of this country, where lead was intimately associated with the whole scheme of our domestic and social life long before the building of our dwellings had been developed into the master art (as it is for every country) of all its truly national and idiosyncratic arts. Man does not live on bread alone; and it must not be overlooked, in the consideration of the question now before the voters of this country, that the revival of the arts of this country during the reign of the Queen-Empress Victoria was profoundly influenced by "Free Trade," and free popular intercourse with the Continent, and the free immigration into this country of "undesirable aliens."

Of course, to restore prosperity to our actual lead mines in Cornwall, Flint, Cardigan, Derbyshire, Durham, Cumberland, Westmorland, etc. (the Isle of Man has suffered nothing from the competition of the foreigners), there would be nothing like raising the price of lead again, by means of a duty on imported lead, to 20*l.* a ton; and by the lead we then took of the foreigner the whole nation would benefit to the extent of the duty paid on it. But is the inevitable decay in the spiritual life of the country which would follow on the adoption of anything like a general "protective" tariff to count for nothing? I am advancing no plea, but simply emphasising one of the several cautions forced on me by the reading of Mr. Starkie Gardner's illuminating paper.

As to its immediate object, I would fain be permitted to add that lead readily conducts heat and cold; a fact which made "the leads of Venice"—the prisons in the roof of the Ducal Palace of St. Mark—proverbial throughout Europe by reason of their frightful heat during the months of summer. But lead might well be used for winter gardens, orangeries, riverside residences subject to flooding, bridges, fountains, and statues of the indicative class, such as the archer at one time placed in front of, or over the entrance to, military barracks—whence such phrases as [*Othello* I., 1] "lead to the Sagittary."

NOTES.

Municipal Borrowing.

WE recently referred to the remarks of Sir Michael Hicks Beach on borrowing by municipalities. It appears that there is more than one corporation which has a huge overdraft with its bankers. Cardiff has been given as an instance in respect of advances for public works. The "tight" condition of the money market and the fact that it is overloaded with stock is said to be the reason for this state of things. It suggests, however, that some local bodies begin work before the funds out of which they should be paid are in hand. If public bodies begin public works and finance them in the first instance by loans from bankers it is pretty clear that the ratepayers' control of expenditure is lessened. It is only when the question of an addition to the rates in the form of a loan by an appeal to the public is raised, that those who are chiefly interested can say if it is desirable to incur this liability. The present stringency of the money market is thus in many ways fortunate, as it will cause local bodies to consider carefully as to the desirability of new works. Those which are necessary will, of course, have to be undertaken; those which are not actually pressing may well be postponed.

By-Laws and Building Schemes.

THE case of Harrogate Corporation *v.* Dickinson should be noted by builders. The defendant was a builder who had deposited and obtained the approval of the Corporation of Harrogate for plans for eleven houses and two coach-houses and stables on October 8, 1894. The defendant had erected some of the houses and one stable and coach-house, but had not completed the rest when on November 7, 1901, the by-laws regulating buildings were altered. Section 27 of the Corporation's Private Act provided that the deposit of any plan of any street or building should be void unless the work specified in such plan should be commenced within three years of the date of the deposit. The defendant contended that he had commenced the work specified in the plan in question, and was therefore entitled to complete it under the old by-laws, but the Divisional Court have affirmed the court below in holding that under this section the plan did not include the whole scheme set out upon it, but must be regarded as separate plans for the erection of each building. It may also be noted that the new by-laws contained a saving clause as to "any work commenced" before a certain date, and that it has been decided in the case of White *v.* Corporation of Sunderland (April 21, 1903) that what constitutes a commencement of the particular work is a question of fact to be decided in each case.

Structural Effects of the Chicago Fire.

FROM a careful examination of the Iroquois Theatre, it appears that the amount of damage done to the building has been very small indeed, although the condition of various exposed parts indicates that a very high temperature prevailed. One result was the destruction of the scenery on the stage and in the scenic tower, and as the play was of a spectacular character the loss was heavy. A bridge used for painting purposes at the back of the stage, and composed of two light lattice girders, was badly warped and twisted. The heating pipes along one wall of the stage were much twisted, and some of them have fallen to the stage. Some iron ladders, at a height of 60 ft., on either side of the stage had sagged from their own weight, and a gridiron of steel beams, at a height of 75 ft., showed evidence of having been subjected to great heat, and some of them had sagged nearly 3 in. Beyond the damage here mentioned, and the destruction of seats, decorations, and plastering in the auditorium, the effect of the fire was not serious. The fireproof floors and roofs were not damaged either by heat or by water. The partitions, dividing various dressing-rooms from the stage, formed a complete barrier to the progress of the fire, and it is worthy of note that these were subjected to a very severe fire test, and were in a direct line with the fire hose. The columns in this partition were covered with wire lathing and plaster, and their protection remains intact. A Roebling floor in the pit is absolutely uninjured except at one point where a heavy weight fell through it. Although the front rail of the balcony was badly twisted, the wire lathing of the suspended ceiling and of the columns was nowhere exposed. The girder supporting a heavy brick wall over the proscenium arch was protected with cinder concrete and wire lathing covered with plaster. In this case the plaster was destroyed, but the concrete remained intact. It is remarkable that so fierce a fire should have produced so little structural injury, and this fact in itself is a very strong argument in favour of fireproof construction.

London Traffic.

IN a letter to the *Standard* a few days ago Sir H. E. Knight gives some further details of the proposals brought forward in his evidence before the Royal Commission on London Locomotion. Our readers will remember that three suggestions were then made for relieving the pressure of traffic and for dealing with the transport of goods in the metropolis. Of these the plan for a tubular goods railway certainly deserves serious attention. If such a line were constructed so as to

establish communication between all the docks, river wharves and warehouses, railway goods stations, Metropolitan markets, and great business centres, it is highly probable that a very considerable proportion of the total goods traffic of London could be conducted without using the public streets. We understand the suggestion is that the tube should be large enough to admit the ordinary rolling stock used by railway companies, so that entire wagon loads of goods could be transferred to the underground line by means of lifts or inclines without transhipment at goods depôts. Even if the whole of the goods traffic could be dealt with in this manner large quantities of merchandise would still have to be carted to the various stations on the proposed line, and goods would also have to be delivered in vans from the various stations; but such traffic would not necessarily be along main thoroughfares. A scheme of this nature should be of immense service in dealing with the traffic problem of London, but a huge system of such lines would be required to produce a perceptible effect. The idea is by no means new, but we are glad to see it brought forward again.

Tramway Traffic. A PAPER in the last official circular of the Tramways and Light Railways Association is devoted to a consideration of the best means for the encouragement of urban tramway traffic. The author is probably correct in saying that it is unnecessary to pay attention to those who enter tramcars for the mere pleasure of riding, and also that comparatively few passengers use tramcars for the purpose of saving trouble and fatigue. For both these classes of traffic horse cars or even omnibuses are quite good enough. The rise and development of modern electric traction certainly appears to confirm the view that the saving of time is the most important element, and that the financial success of a line will be in proportion to the time saved for its customers. We have ample evidence in the existing management of the various London tramway systems that this essential condition has not yet been fully realised. It is perfectly clear that great waste of time is caused by the excessive number of stopping places now provided, and, as a matter of fact, the average speed of electric cars is but little greater than that of the horse cars which they have displaced. The author of this paper has evolved an algebraic formula for determining the most suitable number of stopping places per mile, and he arrives at the fairly obvious conclusion that, from the passengers' point of view, no advantage is gained by fixing the stopping places closer than a quarter of a mile apart. Even this distance is certainly too small during the morning and evening traffic, when it is practically impossible for seats to be secured except at a few intermediate stations. Therefore at such times there is no reason why more than one or two stopping places should be provided in every mile. The reduction of interruptions to the journey would permit the intervals between each car to be diminished, and so a much larger number of passengers could be conveyed over the line, with satisfactory results to all concerned.

High-Speed Traction. WITH the thoroughness characterising the German nation, the experiments in high-speed electric traction are being continued at Zossen, and speeds of more than 130 miles an hour have already been attained. These trials are being conducted in a thoroughly practical manner with a perfectly definite object. Possibly the investigation was not entirely unassociated with the desire to convey troops from point to point with rapidity in case of emergency, but it is perfectly clear that the movement was also inspired by the wish to improve traffic facilities generally. We have learned already that a high-speed electric railway is to be constructed between Hamburg and Berlin, on which the speed of 100 miles an hour is contemplated, and it is said that this will be merely the forerunner of many similar lines traversing all parts of the empire. The project certainly ought to be watched with close attention on this side of the channel, where means of rapid transport are urgently required, notwithstanding the comparatively small distances from city to city and town to town. Average speeds of fifty miles an hour may seem to be quite fast enough for some people, but busy men who are called upon by the exigencies of their work to travel at frequent intervals between the metropolis and various manufacturing centres have to waste much valuable time in railway trains. Moreover, the necessity for frequent journeys seems to increase as time rolls on, and high-speed railways would meet an undoubted want.

Slag Portland Cement. PORTLAND cement has been made from blast-furnace slag for several years in various German and Belgium works and appears to have given satisfactory results. In some respects blast-furnace works are favourably situated for the manufacture of cement, because motive-power can be furnished by blast-furnace gas engines, waste coke can be utilised in the kilns, and the principal raw materials are generally close at hand. The opinion is entertained in Germany that the manufacture of slag cement can be more readily controlled than that of cement made in the ordinary way, as furnace-slag is a product whose chemical composition is easily regulated. Some recent tests, made in the municipal laboratory at Vienna, upon blast-furnace slag cement in the form of 1 : 3 mortar gave the following satisfactory results: (1) Age, seven days: tensile strength, 383 lb. per square inch; compressive strength, 3,880 lb. per square inch. (2) Age, twenty-eight days: tensile strength, 551 lb. per square inch; compressive strength, 5,411 lb. per square inch. Isolated tests of cement mortar are, of course, by no means conclusive, but the figures here quoted certainly deserve consideration.

Sanitary State of Spennymoor District. A REPORT by Dr. Reece to the Local Government Board, in regard to the sanitary condition of the Spennymoor Urban District (Durham), while stating that many of the working-class houses in the district are in good condition, adds the following statement:—

> There are, however, houses which cannot be regarded as satisfactory from a public health point of view. Some few dwellings are so damp and dilapidated that action in regard of them under the Housing of the Working Classes Act is desirable. Again, there are back to back houses, and houses without windows or doors at the back which have all the drawbacks of back to back houses. And there are houses which have but one room, with a small cupboard opening from it, which is used as a scullery or larder. In such dwellings there is generally an attic under the tiles, approached from the living-room by a ladder, but this room is often unceiled. From time to time the Medical Officer of Health reports on this class of house, and some of them have been altered so as to improve their sanitary condition, i.e., the attics have been ceiled, etc. Overcrowding and all its attendant evils are almost inevitable in such houses. . . . Attention should be drawn to a common and very serious defect in most of the dwellings in the district. Many of the back yards are indifferently paved with porous brick, and in addition the bricks are often broken and the yard surface uneven; hence slop water and washings of the polluted surface of the yards lie ponded close to the back doors of the houses.

Dr. Reece, however, seems to consider that the real and greatest evil in the district is the want of a complete and efficient sewerage system, and gives some details as to the unsatisfactory arrangements at present existing for drainage and excrement removal. It is stated that the attention of the District Council has been repeatedly directed to this state of things, but that hitherto they have taken no steps to remedy it.

The Measurement of Radio-Activity. AS QUESTIONS are sometimes asked relative to the measurement of the phenomena exhibited by radio-active substances it may be useful to note the method adopted by M. and Mme. Curie. The substance in question is placed upon one of two condenser plates charged to a high potential. Air between these plates is rendered conductive by the presence of the radio-active substance, the activity of which is determined by measuring the quantity of electricity passing within a given time. By taking as a unit the conductivity imparted to air, under similar conditions, by uranium, the relative activity of any other radio-active substance can be expressed numerically. Thus, if it is said that the radio-activity of radium is x, this means that the quantity of electricity caused to pass from one condenser plate to the other, by a certain weight of radium, is x times the quantity that would pass if an equal weight of uranium were substituted. The quantity of electricity passing within a given period may be determined by an electrometric method, or the time occupied by the passage of a given quantity of electricity may be measured by the aid of an electroscope. In the latter case observations are made by means of a telescope fitted with a micrometer scale, and the time is taken by a chronometer. Such methods are thousands of times more sensitive than spectrum analysis, and still more sensitive than chemical analysis.

Two Old Street Tablets; Clare Market. IN the course of the demolitions now in progress for the laying out of Kingsway have recently been removed the carved stone tablet or sign from the house at the corner of Vere and Clare streets, and the memorial tablet from the "Royal Yacht" public-house at the corner

(south) of Denzell and Stanhope streets. The former, a sculptured sign of two negroes' heads in profile with the initials "W. S. M." and date "1715," had been affixed to the wall at the splayed angle of the house, No. 13, Clare-street, latterly a baker's shop, and possibly had some association with Blackmore, also known as Blackamoor, street in the immediate vicinity. The large tablet of stone had been set in a reveal in the north wall of No. 49, Stanhope-street, and was originally erected as a memorial of Denzell Holles, second son of John, first Earl of Clare, who lived to an advanced age. As the inscription is of a somewhat unusual character, we transcribe it at length :—

Denzell Street—1682 So called by Gilbert Earle of Clare in Memory of his Vncle Denzell Lord Holles who dyed February ye 17th: 1679 Aged 81 years: 3 months a great honour to his name and the exact paterne of his fathers great Meritt John Earle of Clare

Below the inscription is inserted, in a different and later style of lettering, "Rebuilt by Hy. Cocker 1796." John, second Earl (*obiit* 1665), had long been a resident there, and, in or about 1653, founded the flesh and fish market, originally New Market, which Howell mentions in his "Londinopolis," 1657. In 1643 Charles I. licensed Gervase Holles to erect a certain number of houses on the north-west of the later market square : the Bill of 1657 for preventing an increase of buildings reserved the right of the Earl of Clare to continue building in that part of the town.

Royal Academy Lectures.

PROFESSOR CLAUSEN'S closing lecture, delivered on Thursday last week, on "Realism and Impressionism," was a kind of summary of the news expressed in the preceding lectures. As an example of the highest idealism in painting might be taken Michelangelo's Sistine Chapel, the greatest painting in the world, which included every great quality of painting —drawing, colour, and expression—in complete balance. Reynolds, though constantly referring in his lectures to the greatness of Michelangelo, nevertheless himself followed rather the Venetian school, evidently recognising Michelangelo as an ideal out of his reach. It was of no use to think of imitating Michelangelo's manner without his spirit ; Stevens perhaps alone among modern artists had caught something of both. Failure in idealism arose from thinking of matter more than mind. Realism was of two kinds ; it might be a realism merely of external facts, or a realism of character, though not giving facts exactly ; or there might be a balance between the two. Mere realism of surface was false—an evasion of difficulties ; the sum of little details did not give the whole, though (as Van Eyck, Holbein, Madox Brown, and Millais had shown) minute detail was not incompatible with breadth. Realism of character did not depend on realism of externals ; it was the result of abstraction, and was mostly arrived at towards the end of an artist's life. Realism in detail was only suitable to real subjects ; minutely finished and embroidered costume, for instance, was out of place in representations of ideal and imaginary personages. The finish of such detail in Botticelli's pictures was only acceptable because that early detail had itself become legendary to us. Consistency must be maintained, and a picture might in fact appear more real for being less realistic. The painting of objects as an end in itself was a mistake ; the artist should give his reading of the subject. It was difficult to draw a precise line between realism and impressionism, but the school called Impressionist arose in the fact that the study of colour as affected by light seemed to offer a new field. In this sense Turner was the first and greatest impressionist. Manet and others had tried painting in spots of colour in order to preserve the effect of colour and sunlight ; the result was interesting, but was it beautiful ? De Hooghe could give the effect of colour and sunlight without any such method : you had only to take a lower key. Impressionism was a far too self-conscious form of art, though it had attained some truths as to light and colour. If it were asked, How far may we follow old conventions ? he would say, as far as you need them and understand them. Pictures and nature threw light on each other, and there must be some point of reconciliation between old and new conventions. Touching on the subject of Japanese art, Professor Clausen thought that while it was an art which in its own way gave great pleasure, the adoption of its system in Western art could only be an affectation. Japanese art was essentially that of children—not childish, but childlike. Their method of making pictures by simple masses of colour was interesting in itself, but it was not our nature to see things in that way. The aim of the educated artist should be to find out which out of many possibilities he really wanted, and endeavour to develop that.

LETTER FROM PARIS.

THE death of the Princess Mathilde, the cousin-German of Napoléon III., has been a loss to the world of Art in Paris. Both under the Empire and under the Republic she had remained entirely apart from politics, and her Salon was a neutral ground, where the representatives of Art, Literature, and Science met without regard to political opinion ; and all parties in the State were represented at the funeral of the "Bonne Princesse." She has left to the Louvre some gifts of real value, among them a portrait of a lady by Reynolds, that of the Prince Impérial by Jules Lefebvre, portraits of King Jerôme and of Prince Napoléon, by Hippolyte Flaudrin, a "Pompeian Interior" by Boulanger, and the portrait of Giraud, the painter, by Paul Baudry. The Carnavalet Museum and Musée des Arts Decoratifs have also received important additions to their galleries.

The appointment of M. Homolle as Director of the National Museums, in place of M. Kaempfen, who has retired at the age of seventy-seven, has given general satisfaction. M. Homolle was a brilliant student, in the first instance, of the French School at Athens, of which he has been for the last ten years the Director, during which period he was fortunate enough to have the great chance of the explorations at Delphi put into his hands, and carried them out in so successful a manner. M. Chaumié, the Minister of Public Instruction, when visiting Greece two years ago, had the opportunity of making the acquaintance of M. Homolle, and seeing the work which he had carried out at Delphi, and has now selected him to fill the still more important post left vacant by M. Kaempfen's retirement.

One of the first matters with which the new Director will probably be concerned, is the important question of the reconstruction of the Luxembourg Museum, the oldest of the museums of modern art in Paris, and also of one which is in the most deplorable condition. He will probably receive the complete support of the Department of Public Instruction in the carrying out of this great scheme, the necessity for which has only recently been strongly urged on the Government in a petition to Parliament from the Society called "Les Armis du Luxembourg."

This last-named Society, whose enlightened zeal in the cause of art has been successfully exhibited on two or three important occasions, has taken the initiative in a proposal for giving to artists and their widows a more or less permanent copyright value in the sale of their productions, similar to that of authors' rights in the sale of literary works. There may be some difficulty about the arrangement of the system to be employed in carrying this idea into practice, but it is believed that it will receive serious consideration, since it is generally admitted that artists are at present in a far less advantageous position in regard to any benefit which their heirs might obtain from the value of their works, than literary or dramatic authors or musical composers. The Société des Artistes Français (Old Salon), is at present occupied, also, with its scheme for the benefit of artists, viz., the creation of pensions "de retraite," in favour of artists who are too old to continue the practice of their art. According to the scheme which M. Boisseau, the Secretary and Treasurer, has been instructed to draw up, it is proposed that the conditions for obtaining this pension should be that the recipient should have been thirty years a member of the Société, and be seventy years of age. He must also have exhibited at fifteen of the annual exhibitions during the period of his membership. An exception will be made, however, to this last condition in the case of architect members, whose exhibition of works at the Salon is naturally much more irregular and intermittent than in the case of the other classes of exhibitors.

At the Ecole des Beaux-Arts no decision has yet been taken as to the appointment of any one to succeed Gérôme as Chef d'Atelier of the painting section of the school. M. Dagnan-Bouveret was at first talked of, but it seems likely now that the choice will lie between M. Ferdinand Humbert and M. Albert Maignan.

There is talk again about lighting the Bois de Boulogne by electricity, provided the State will pay half the cost. In that case, lighting would be established along the avenue leading from the Porte Maillot to the Porte Dauphine, along the one leading to the lakes, and on the drives round the lakes. The change would not only render the promenades more attractive on summer nights, but also render them more safe than, in spite of the police patrols, they can be said to be at present.

It is proposed to erect a monument to the poet André Chenier, who was guillotined under the Revolution. The position is not yet chosen, but the committee have commissioned M. Denys Puech to prepare a model, in which the medallion portrait of Chenier will be accompanied by a reproduction of M. Puech's figure the "Jeune Captive," which is in the Luxembourg Museum. M. de Saint-Marceaux has just completed the full-size model of the monument which is to be erected by public subscription to the memory of Dumas *fils*, opposite that of the elder Dumas on the Place Malesherbes. The monument, which is to be executed in stone, is a fine and harmonious composition. It represents Dumas seated in a flowing robe, and with a pencil in his hand, with a group of draped figures at one side of the circular pedestal, who are supposed to symbolise the principal works of Dumas, especially the "Dame aux Camélias." Behind this pedestal is another figure personifying Youth. The monument will count among the best works of M. de Saint-Marceaux, who, it may be added, is well represented at this moment by his work exhibited at the salon of the "Union Artistique," popularly called "L'Epatant," which has just opened, where there is also some good sculpture by MM. Carlés, Verlet, and Crank. Among the paintings at the same exhibition is a splendid portrait of Gérome by M. Aimé Morot, and pictures by MM. Chartran, Roybet, Bonnat, Jacques Blanche (who recalls more and more the style of the English painters of the XVIIIth century), Detaille, Dagnan-Bouveret, Billotte, and Walter Gay.

The jury in the competition for designs for the reconstruction of the Hotel de Ville of Troyes has awarded the premiums of 12*l.* each to the following architects who will now take part in the final competition : MM. Balley

and Monceau, of Saintes and Paris; H. le Grand, Paris; Guillaume Tronchet, Paris; Robert and Hameau, Paris; Charles Duval and Robida, Paris; and Emile Hochereau and Gabriel, Paris. The competition organised by the Minister of the Interior for designs for the construction of a hospital at St. Maurice, has been decided as follows: The execution of the work to MM. Bassompierre-Sewrin and Fiault, architects, Paris; 2nd, premium of 40*l*., to M. Tronchet, Paris; 3rd, premium of 20*l*., to M. Quarez, of Fontenay-sous-Bois.

The jury for the annual "Concours de Façades" has arrived at a decision, and the six buildings following have been premiated: No. 17, Rue Lafitte, architect, M. Nénot; 38, Rue Fabert, architect, M. Hodanger; 133, Boulevard Menilmontant, by M. Bocage; 23, Rue Mogador, by M. Labouret; 164, Rue de Courcelles, by M. Delage; and 45, Rue de Bellechasse, by M. Muscat. A gold medal has been awarded to each of the above architects, and bronze medals to the contractors.

The following subject has been given for the annual competition in decorative architecture called "Concours Achille Leclerc," at the Ecole des Beaux-Arts: "A Grand Staircase for a Museum." The staircase, starting from a monumental vestibule, is to give access on its first landing to the principal hall of the museum situated between the levels of the ground and first floors, and on the main landing on the first floor to the other rooms situated at a height of 30 ft. above the floor of the vestibule. The portions of the buildings contiguous to this staircase are to be indicated on the drawings, and the preliminary sketches should be to a scale of 1-16 in. to a foot for the plans, and ½ in. to the foot for the sections. The final drawings, which the students have to send in by March 2, are to be on the scale of ½ in. and ¼ in. to the foot for the plans and sections respectively. The Godebœuf competition, the subject for which was "Une Marquise Vitrée," was decided in favour of MM. Boutin, Camille Lefevre, and Pierre Aubey, to whom first medals are awarded. M. Février, pupil of M. Marcel Lambert, carried off the prize in the Labarre competition, the subject for which was "Un Hotel pour Ouvriers."

The visit of the "Société des Amis des Monuments et des Arts," organised by M. Charles Normand, architect, was made this month to the buildings of the Théâtre Français. The party was conducted by M. Guadet, the architect of the building. MM. Guadet and Prudent gave a short historical description of the various theatre auditoria constructed by the architect Louis, culled from the documents they had got together for this purpose.

The new Coquelin-Binet theatre to be constructed at Paris will be entirely built of armoured cement, from the special designs and ideas of the actor and the architect named above. M. Coquelin and M. Binet have asked the Municipality of Chicago to allow the reconstruction of the Iroquois theatre to be undertaken on this system.

The competition organised by the proprietors of the Grand Hotel at Paris, for schemes for the transformation of the present courtyard into a winter garden, with an entrance from the Rue Scribe, has been decided in favour of M. Lucien Bechmann, a young Parisian architect, late pupil of M. Laloux. The premium awarded to M. Bechmann is 100*l*., and second and third premiums of the value of 80*l*. and 60*l*. respectively have been awarded to M. Jean Fugairon and M. Olivier Carré, both architects of Paris.

It has been decided to demolish the important barracks situated on the Boulevard Lannes, just in front of the fortifications, and this decision would appear to be the commencement of the preparatory work for demolishing the fortifications of Paris from the Porte Maillot to the Point du Jour. The barracks will be reconstructed just outside the present line of fortifications.

The Prix Lheureux, a foundation prize at the disposal of the Town of Paris, to reward each year and alternatively the finest work accomplished by an architect or a sculptor, has just been awarded to M. Pascal, architect, member of the Institute, President of the Academie des Beaux-Arts for 1904, for his important work of the completion of the Bibliothèque Nationale. This prize was carried off for the first time in 1900 by the late sculptor Dalou, for his monument on the Place de la Nation, the Triumph of the Republique; in 1901, by M. Charles Girault, for the Petit Palais des Champs Élysées: and in 1902 by M. Barrias, for his monument to Victor Hugo.

The Academie des Beaux-Arts has elected M. Pascal, the well-known architect, President for 1904; M. Edouard Détaille becomes Vice-President in the place of M. Pascal.

The officers for 1904 of the Société Centrale des Architectes are: M. Nénot, President; MM. Etienne, Bartaumieux, Bellemain, Vice-Presidents; MM. L. Géorge, Chief Secretary; Nizet, Archiviste; and Poupinel, Treasurer. The Société had requested both M. Pascal and M. Daumet to offer themselves as candidates for the Presidentship, but M. Pascal declined for reasons of health, and M. Daumet on account of his advanced age. The officers of the Société des Artistes Français for 1904 are as follows: M. Tony Robert-Fleury, President; MM. Nénot and Coutan, Vice-Presidents; MM. Albert Maignan, Chief Advising Secretary; Boisseau, Treasurer; and Richemont, Géorges Lemaire, Pascal, and Mongin, Secretaries. The Société des Architectes Diplomés has elected the following officers for 1904: President, M. Louis Bonnier; Vice-Presidents, MM. Defrasse and Albert Guilbert; Chief Secretary, M. Léon Davouste; Librarian, M. Jalabert; Treasurer, M. Maurice Poupinel; and MM. Maurice Glas, Roger Bouvard, and Payret-Dortail, Secretaries.

The Committee of the Société Nationale des Beaux-Arts has decided that the New Salon of 1904 will take place from April 16 to June 30. Works of Architecture and Sculptures are to be sent in on March 18 and 19, and works of Painting on March 8 and 9.

M. Stanislas Ferrand, architect, manager of the building journal *Le Bâtiment*, has written a letter to Mr. Andrew Carnegie in reference to the proposed Palace of the Tribunal of International Arbitrage, for the construction of which Mr. Carnegie has just handed to the Dutch Government a first sum of one and a half million dollars, asking him to allow this building to be the subject of an international competition.

The scheme of prolonging the Boulevard Raspail from the Rue de Vaugirard to the Boulevard du Montparnasse has now been declared of "public utility," and the Prefect will at once proceed with the negotiations for the expropriation of the ground. The various street works are estimated at 700,000*l*.

The Société des Monuments Parisiens has voted the preservation of the whole of the old buildings of the old Ecole de Médecine, situated in the Rue de la Bucherie. This building dates from 1474, and a few years ago was purchased by the Municipality. The building is interesting from the fact that it is the only portion remaining of the four buildings which belonged in the XVth and XVIth centuries to the medical faculties; some portions are also interesting architecturally.

We regret to have to record the death of an eminent French architect, M. Corrover. Some further notice in regard to him will be found under the head of "Obituary" on another page.

THE ROYAL INSTITUTE OF BRITISH ARCHITECTS.

An ordinary meeting of the Royal Institute of British Architects was held on Monday evening at No. 9, Conduit-street, Regent-street, W., Mr. Aston Webb, R.A., President, in the chair.

A Bequest to the Institute.

Some nominations for election on the 29th inst. having been read, Mr. Locke, Secretary, read a letter from Mr. A. Saxon Snell, acknowledging the receipt of the letter of condolence sent by the Institute to the relatives of the late Mr. H. Saxon Snell. Mr. Snell thanked the Institute for their kind expressions, and added that it was his privilege to say that, under the terms of his father's will, 750*l*. had been bequeathed to the Institute for the institution and maintainence of a special triennial scholarship.

The President said he was sure that every member of the Institute would be grateful to Mr. Snell for the bequest for the encouragement of architecture and the education of young architects. Later on, when particulars of the scheme had been received, they would communicate their thanks to Mr. Snell.

The Royal Gold Medallist.

The President announced that the Council proposed to submit to His Majesty the King, as a fit recipient of the Royal Gold Medal for the promotion of architecture, the name of M. Auguste Choisy, Chief Engineer in the Service des Ponts et Chaussées, Paris.

President's Address to Students.

The President then read the following address to students:—

Brother students, for a second time it falls to my lot to address a few words to you on the occasion of the presentation of the prizes offered through this Institute.

Last year my subject was the importance of work for all intending to follow the art of architecture, and I was told by some that this doctrine was a little hard upon the young men, while, on the other hand, some students were kind enough to write me that they had found what I said encouraging and useful. Still, though I do not believe for a moment that young men are afraid of hard work, I propose to-night to say something on the pleasures in connexion with architecture, for I think there is no work in the world which has more pleasant by-paths and quiet resting-places than the art of architecture. Of course the greatest pleasure of all is the pleasure of your work. If you do not feel this I advise you, as I did last year, to throw up architecture and to take to something else before it is too late. Yet what pleasure can be greater than seeing the realisation of your ideas in brick and stone, even though your steps may be faltering and the result disappointing? If you can say with Tennyson, "Once in a golden hour I cast to earth a seed, Up there came a flower," then those golden hours will be your pleasure in life; few and far between they may be, but never to be forgotten when they come, and their memory will not fade.

Mr. Stopford Brooke, in closing his "Life of Browning," describes him in words which, perhaps, you will allow me to quote, for they apply to an artist in stone as much as to one in words. He says of Browning "No fear, no vanity, no lack of interest, no complaint of the world, no anger at criticism disturbed his soul. No laziness, no feebleness in effort injured his work, no desire for money, no faltering of aspiration, no surrender of art for the sake of fame or filthy lucre, no falseness to his ideal, no base pessimisms, no devotion to the false forms of beauty, no despair of man, no retreat from men into a world of sickly or vain beauty." And then, later on, he describes him as "Creative and therefore joyful, receptive and therefore thoughtful." Then he continues, "Italy was his second country, in every city he had friends—friends, not only among men and women, but friends in every ancient wall, in every forest of pines, in every church and palace and town hall, in every painting that great art had wrought, in every storied market-place, in every great life which had adorned, honoured, and made romantic Italy."

What a vista of pleasures such a life suggests; and I venture to recommend to you young men to take such an ideal as your standard and determine to live as near to it as you may. It all seems very high-flown and impossible, perhaps, at the moment, surrounded as you no doubt are, as we all are, by the petty cares, troubles, and drudgery of everyday life; but it is just because we are so surrounded that we should set your minds on something better, and you will come to find some good even in drudgery, as Carlyle found in the "common journey-work, well done for want of better."

One of the pleasures an architect should cultivate is reading—poetry of all sorts and kinds, romances, plays, and imaginative work generally. If you are to be creative you must also be receptive; you cannot always be giving out unless you are also taking in; and if you cultivate the habit of reading you will be able to get rest and refreshment from it, even at times of the greatest perplexity, anxiety, and even embarrassment. But you must acquire the habit while you are young, and it will enable you in the future to transplant yourself for an hour or two, at will, into an enchanted land, where builders cease from troubling and even your clients (or your desire for them) will be at rest. Another of your pleasures will be the study of painting and sculpture (modern and antique). Alfred Stevens, sculptor, painter, and architect, used to say, "I know but one art"; and if you are wise you will know but one, and train yourself accordingly.

And now, what are the other pleasures of an architect's life that may be indulged in, with advantage to himself and his art? I will name a few, though you already know them well; and in naming them I do not suppose you can entertain them all. Still, you may acquire a nodding acquaintance with many of them; though, if you do, kind friends will probably

remind you of the proverb, "Jack of all trades, master of none." But there is a much wiser proverb than that, "Know a little of everything, and everything of something." Follow that and you will be a well-equipped man, and that alone will be one of your greatest pleasures in life.

Travel is another of the pleasures that naturally appeal to an architect. You may go round the world or over Europe, or through England, though this costs money, and perhaps that is not a plentiful article with you. Well, then, you have plenty of scope in London alone, which need not cost anything to those who live here. Sir Laurence Alma-Tadema gave a needed hint last year to those about to travel, not to go abroad till they knew something of their own country and their own city. Here in London we have two of the finest Gothic and Renaissance churches in the world, a series of Renaissance parish churches unequalled anywhere, and a wealth of domestic and commercial buildings, ancient and modern, that would take a man's life to know. A friend of mine, an architect, has hardly been out of England all his life, and I verily believe his art is the better for it; yet how few study what is at their doors. "For thus 'twas ever, things within our ken owl-like we blink at, and direct our search to farthest Inde, in quest of novelties."

To enjoy travel properly you must, of course, sketch and draw a little. In my day we used to make water-colour sketches, which had no value as pictures and still less as architectural records; but the making of them was and still is to some of us a distinct and harmless pleasure, not to be overlooked but enjoyed in moderation. The same pleasure can, I think, be got from pencil sketching, with a few of the leading dimensions added, and, though such sketches cannot be *framed*, they will be *useful*, which is far more important. The true value of all sketching is to enable the student to arrive first at the end the artist aimed at, and then to discover the means he employed; apart from this all the pretty draughtsmanship we see is quite thrown away. Still, sketching will always remain, however pursued, one of the recreations of an architect's life. Painting is not for him, except of course a general knowledge of painting and sculpture—enough to enable him to form an opinion of good and bad, and to distingish the works of different masters by their various methods; and no man should think of going to Italy without first mastering to some extent our great collection in Trafalgar-square.

Then there is archæology—a good servant but a bad master. We have allowed it to be our master for close on a century, and in return it has well-nigh strangled all the life out of us, so that we dare not call our style our own. The other day I was asked to write my opinions on what is called "l'Art Nouveau." I was obliged to decline; but had I done so, I should have said that, though no admirer of that particular phase of art expression, I welcome almost any effort to break through the paralysing trammels in which archæology has bound so much of our work. Still, what greater pleasure can there be than to stay in a country village and trace the growth and history of its parish church, to study the Norman beginning, the various extensions from time to time for increased accommodation or display, the Founder's tomb with his geneology and heraldry, perhaps the matrix of a brass and the disfigured font, the occasional floor tile and the oft-deciphered fresco, all making an ideal holiday and an unadulterated pleasure; only, I must add, you had better leave it at that, and not attempt to reproduce what is not reproducable.

Then there are what I may call the somewhat sterner pleasures, such as the study of geology and chemistry. Unless you have had your thoughts directed to these at school you are hardly likely to take them up afterwards; but if you have, you will do well to keep in touch with them. The cliffs and the hills will be of more interest to you for the time, and all life for the other, and the materials with which you build for both.

Music, if you are gifted that way, will give you endless pleasure, if not apparently in very direct connection with your work; yet there may be more relation between the harmonies of sound and the harmonies of proportion than are at present dreamt of in our philosophy.

Another pleasure of a very different kind is that of criticising—not the pleasure of being criticised; that is a chastening ordeal good no doubt for all of us (and one which is never lacking); not the friendly criticism, however severe, among ourselves of each other's work, which is natural, improving, and proper; not the friendly and informing criticism, such as we shall no doubt hear from Mr. Gibson to-night; but the pleasure it gives to some to find fault—to set up for themselves some almost impossible preconceived ideal of perfection, and then to hold up a building to scorn and reproach because it has not reached this ideal. Be as severe a critic as you like of your own work, and never allow yourself to be fully contented with it; but if I were you, I should leave criticism of the other sort as much as possible alone. It is no doubt a duty which some feel bound for the good of their fellow-countrymen to undertake, and useful it no doubt is; but remember what the old Don said to his students: "Everyone may be mistaken sometimes, even the youngest of us." You will find, I think, more real pleasure in the admiration of noble things and fine design than in the criticism of even mean and inferior work.

Perhaps one of the greatest pleasures our work offers to us is the opportunity and pleasure of friendship. Our branch of art is essentially associative. It is conceivable a man may paint a picture or carve a statue in the loneliness of his studio, unassisted by his fellow-man, and, as a fact, many painters take pride that they do this, and that their work is that of their own unaided hands. With us it can never be so, and we must cultivate sociability, and be able to rub shoulders and associate with all members of our craft. A policy of splendid isolation is at least of all suited to an architect amongst artists. You will, if you are wise, be friends with all whom you employ. You will get better work from an intelligent mason by a little friendly chat with him, than with all your stringent clauses in specification and conditions of contract.

Some people seem to think an architect is a sort of detective set over the men to watch them, and would be horrified to see their architect on friendly terms with those they employ; but such people are not those that are best served, or get the best work done in the end. The architect should rather be in the position of the general selecting his lieutenants to assist him in the work, and enjoying the full confidence of his men; they should be proud and pleased to see him on the work, anxious he should see what they are doing, knowing he will praise where praise is due, and blame only where blame is necessary. This may sound to you a little Utopian, but it should not do so. If it is there is something wrong somewhere, and it is for you young men to help to set it right.

Then the pleasure of friendship with your brother-architects is one that may last your life or theirs. Our meetings here, and at the Architectural Association, offer the opportunity of sowing the seed, which can be strengthened in numberless ways. For myself, I have always been a member of one or more small coteries that meet periodically at each others' houses, and they have always been red-letter days to me. In London, personal competition is rarely so keen that the most strenuous life need not be the cause of losing friends. I have heard that the late William Burges used to say, the happiest moment in an architect's life was when he received notice that he had won a competition, and before the troubles and anxieties of carrying it out had come upon him. But I would not myself lay too much stress on this, for there is also from time to time, to the man who competes, the counter-balancing depression caused by the receipt of a communication of a different kind. At the same time, I may be allowed to say that some of my happiest times have been passed in working out large competition problems with my friend Mr. Ingress Bell, and I have found there is real pleasure attending on such work.

And now I have left the greatest pleasure of all to the last, the pleasure we may legitimately feel in going over our completed building, in which we have done our level best, with all the skill which we have been able to bring to bear upon it—no detail ill-considered, no requirement overlooked; perfect it cannot be, but if it is as perfect as we can make it we may legitimately be proud of it and honestly pleased at its completion. What more touching picture than the aged Christopher spending each birthday, after the completion of St. Paul's, under its mighty dome? You may be sure that was one of his greatest pleasures in later life, and one he could not have enjoyed had he not known he had done his best.

And now I have very imperfectly jotted down, amid a variety of occupations and distractions, some of the pleasures that may come into our lives if we will; it is pleasant for a moment to dwell upon them and to leave dull care behind. Such are the things that will help to make us sing at our work and enjoy it, and so make others enjoy it. You and I will not stand here face to face again, as we do to-night, and so I am glad my last words are not of faction, of disputes and controversy, but of the pleasant side of our art.

I am well aware I have said nothing of that all-important matter Design. I have refrained from doing so, because I believe, with William Burges, that this is a direct gift given to each of us in a more or less degree, and there is, therefore, no good in talking any more about it; but, in wishing you all farewell, I also wish you every success in the future. Some of you will, I doubt not, occupy this chair in due course, and be as surprised to find yourself here as I have been; but whatever may be in store for you, determine you will hold high the standard of our art, and keep your shield bright so that you may stand before the world and be not ashamed.

Review of Students' Work.

Mr. Locke, secretary, in the unavoidable absence of Mr. Gibson, then read a review of the works submitted for the prizes and studentships, 1904, which had been prepared by Mr. J. S. Gibson. Speaking of the Essay Prize, for which no work had been submitted this year of sufficient merit to obtain the prize, Mr. Gibson said that repeated attempts had been made of recent years to get a good response for the Essay Medal, and this year eight competitors entered the lists; and it was disappointing to think that not one of those had sufficient grasp of the subject or literary style to obtain the prize, which he was confident would not be withheld by the Council without just cause. Now, the value of expressing oneself clearly in good, terse language, was of great moment to them as architects, and the habit of putting in writing their ideas, desires, and conclusions was certainly one they should cultivate. They need not think that they had to be a Ruskin in their command and mastery of language to obtain this prize; literary style and finish were no doubt essential, but the cultivation of style would in itself be a pleasure and bring its own reward. To those who were ambitious—and surely ambition courses through the veins of youth—there was an incentive in knowing that the name of one of the foremost novelists of our time, Thomas Hardy, will be found on the Institute scroll as prize essayist for the year 1862. In taking leave of this subject, he would say, as one who had had some experience on the Prizes Committee, that they find the greatest difficulty in obtaining subjects for the essay and also for the designs—subjects which should be broad, likely to appeal to a great number, and of value to the whole profession. He was sure the committee would gladly welcome suggestions of subjects for future prizes, and those who had any ideas should send them in at once for the consideration of the committee. But they should remember that anything in the nature of specialisation was to be avoided.

As to the drawings, he proposed to review these in the order of their educational sequence or value, taking first the Measured Drawings, the Pugin Studentship, and the Owen Jones Studentship, as studies of old work upon which architectural knowledge is based; secondly, the Grissell Medal, as design governed by construction; and, lastly, the Tite and Soane Prizes, as designs which show the fruition of the first two groups. He thought that if students entered for these prizes in the order he had named, they would be going through an educational experience which would be of great value to them and likely to lead to beneficial results.

Mr. Gibson then made some critical remarks on some of the drawings submitted. In dealing with the measured drawings, he said that students should remember that T-square and compass-drawing was the most elementary kind of drawing and easily acquired. All students would do well in their full sizes to make it quite clear which was the section side of their mouldings, as several of those submitted would read equally well either side, and he would suggest a flick of the brush occasionally on the inside of the moulding, or a thick and thin section. They might find it very annoying in after life to have, for

example, their plaster cornices run the reverse way of the moulding because they had not made it absolutely clear which side of their drawing they wanted the mould cut to fit.

Speaking of the Owen Jones Studentship, he said he would especially direct the attention of students to the unwise practice of late years of showing examples of marble and mosaic floors and wall linings of elaborate geometrical patterns, which apparently entailed an enormous amount of purely mechanical drawing to portray, the artistic results of which were so limited in scope and value. The endeavour of the student should be concentrated on getting a grasp of the motive that underlay the decorative scheme of any building, the basis upon which the scheme was founded. A note of the detail of a floor or a frieze which was almost entirely geometrical and mechanical in the repetition of its parts was quite enough if the note be a true one as to colour and form. He would strongly urge students to concentrate their energies on architecture decorated with colour, to portray examples of church roofs, arcades, walls, and domes; they would find the work just as interesting as doing a few scraps of glass or mosaic or tiles, and they would be better equipped to deal with the decoration of their own buildings. They would thus be able to dispense with about one-half of the drawings now sent in, and the Council would be much better able to judge if the winner was likely to benefit from the further study which the Studentship affords.

As to the Grissell Medal, he said that the problem is one in carpentry, and one which had been solved by the old carpenters who worked on our mediæval cathedrals in many beautiful and interesting ways, and he thought as an exercise it should be worked out logically in the same fashion, and not have rolled steel joists and concrete floors introduced into its solution, as was done by some competitors. He did not mean for a moment that they should discard the modern steel joists and other inventions, but rather that an exercise in carpentry should be worked out in carpentry, and one in stone worked out in that material. There were few things more inspiring than the grand old roofs and lanterns of the carpenters who knew the capabilities and value of their splendid material.

Mr. W. Goscombe John, A.R.A., said it was his pleasing duty to propose a vote of thanks to the President for the very delightful address he had given them. He (the speaker) was there as a sculptor guest, and very frequently sculptors found themselves the guests of architects, and still more frequently sculpture was the guest of architecture. The pleasures of architecture were, perhaps, to all lovers of art, the most common; the pleasures of painting and of sculpture were, perhaps, much more limited. Wherever one travelled, however obscure the place might be, however tiny the village, one could always find something of interest in its architecture—in the tiny church, for instance, or the tiny cottage, in which there was generally something to interest one and exercise one's critical or one's archæological faculties. This was not so with sculpture nor with painting, and therefore to artists generally there was no art so vitally interesting as the art of architecture. The President had mentioned William Burges; he (the speaker) had the pleasure of knowing him as a boy, and he received much encouragement and advice from him. Burges was a most inspiring worker.

Mr. W. D. Caröe, in seconding the vote of thanks, said he could not help expressing a note of sadness in hearing from the President that that would be the last address from that chair which he would deliver to students. It had been a great pleasure to him and all of them to see their President in that chair, and it would be a matter of regret to them if their President did not serve for the third year. No happier words could have been spoken than those they had heard as to the pleasure to be derived from the pursuit of architecture. He had often felt that there was no side of architecture which the public knew less about and which, perhaps, was not observed by architects themselves as much as it might be, than the joy which their work gave to architects, and it was a happy inspiration when the President thought of making that the subject of his address. It was not easy to add to that list of pleasures about which they had heard, but there was one, perhaps, —one little one—which was a big joy to him, *i.e.*, the great pleasure there was, not only in seeing one's completed work, but in being actually present on the building, and to see it grow. That was the greatest pleasure that architecture afforded him. There was, as the President said, a great pleasure in seeing their work grow on paper; but he had often wished that the practice of the profession could be altered, and that it should be a self-denying ordinance amongst architects to carry on only one building at a time, and be present all the time of its erection, and watch brick grow-up on brick, and stone on stone; and in that way they would derive a pleasure which few other professions could boast. He thanked the President for his kindly words and charming thoughts.

The vote of thanks having been heartily agreed to,

The President replied on behalf of himself and Mr. Gibson. Mr. Gibson had given them a delightful criticism of the students' works. It was difficult to make those criticisms truly and yet not hurt the feelings of others, but Mr. Gibson had really hit the happy medium. The President then drew attention to Mr. Fulton's Soane Medallion drawings, Mr. Gascoyne's Tite Prize drawings (1902), and Mr. J. H. Gibbons' Pugin drawings, which were on exhibition in the Meeting Room. All these drawings would well repay examination.

Distribution of Prizes and Studentships.

The President then distributed the prizes and studentships. For a full list of the successful competitors, see our issue for January 23, page 78.

The President said that the subject of the paper to be read at the next meeting showed the varied interests of the profession. On February 15 Professor F. Clowes will read a paper on "The Bacteriological Disposal of Sewage."

The meeting then concluded.

THE SAFETY OF THE UFFIZII GALLERIES.

On revisiting the glorious treasures (the world's, not Italy's only) at the Uffizii, I was seized with sudden horror as to the danger existing in these important Galleries from the smallest accident by fire, and of the extreme difficulty in meeting it should the least opportunity be offered for that destructive fiend to gain a hold upon them.

Recent anxieties as to the safety of our own National Gallery from fire have been met by the pulling down of a building which might have threatened, and, in fact, recently being on fire, did threaten and endanger, a collection of works of art which, though called National, is really a part of the world's treasures.

Visitors to any of these world-renowned collections of works of art are carried away with the delights of the show, and can scarcely be expected to take into consideration how they are preserved from the ever-present dangers of modern life, even when seeing open charcoal stoves or braziers in rooms, or noticing water-buckets or hose at hand in case of accident. But once think of it, and, as I said, horror will seize you if you recognise that all these glorious things might pass away for ever in flame and smoke—in a short hour or two—as, alas! many a less likely group of artistic treasures have done.

It is, of course, scarcely necessary to remind you that the Uffizii picture galleries are all on the top floor of a building built by Vasari, 1560-74—not for this present purpose—with wooden roofs and overhanging eaves, 5 ft. to 6 ft. projection at least, characteristic of Florence at the period, supported only on piers, comparatively narrow, of solid work. The openings between these piers are filled in with ranges of wooden window-frames One large range of the Galleries is not far from the opposite one, and they are joined by a gallery with similar ranges, so that, in fact, for a total length of several hundred feet there is no break in the continuity of windows and piers and overhanging wooden roofs and ceilings, only the floors being of incombustible material, and these probably only the surface of marble mosaic.

Thus every facility is offered for fire to run along from end to end, or be carried by a cross wind from side to side.

At one end or corner next the Palazzo Vecchio is the large open staircase, and there is a lift which is generally being used by the public. This, if not sufficiently cut off, is one of the easiest means of carrying fire upwards or distributing smoke.

This lift is needed for many visitors, as the galleries are as many as 126 steps above the ground—showing a height at least as much if not more than the 60 ft. above which height the London Building Act requires fireproof roofs and construction and special means of escape.

It is true the Tribune and other apartments—or *Salas*—are divided by walls from the long corridors and from each other, but the roofs referred to cover all, and many of the roofs have the same kind of wide casement windows at the back as those in the corridor.

It is needless to add that none of these walls pass through the roofs, if indeed they pass the tie beams, or go higher than the ceiling, and so cannot afford any check to the continuity of the roofing.

The stories below these upper galleries are devoted to various purposes, some portions for the store of public archives, some for the public library, and a large portion for the post office, while under the arcades on the ground floor are wooden temporary stalls for the sale of postcards, etc.

The galleries themselves are connected by a bridge with the Palazzo Vecchio, and by the long gallery along the banks of the river and over the Ponte Vecchio with the Pitti Palace. Thus access is afforded for assistance and escape if needed at each end, it must be admitted, as well as danger for the spread of fire. But attached to the buildings—so that the roofs almost adjoin on the Lung Arno—are high residential buildings, warehouses, and workshops, separated in places by narrow lanes, or connected by covered archways, and that danger exists from these is too evident if one looks at the buildings lighted up in the evening in various rooms of many floors at high levels—all very picturesque, but dangerous.

The breakage of a lamp might be sufficient to start a conflagration not easily extinguished in some of these high roofs, and how long it would take to spread depends on the wind at the time, and local fire extinguishing appliances are not very evident.

As to the damage from water used to extinguish the fire—if it were there to be used—I need not remind you.

But I think I have said enough to be dubbed an alarmist by those quiet folk who think it absurd to trouble till the evil is come, and then say it is too late.

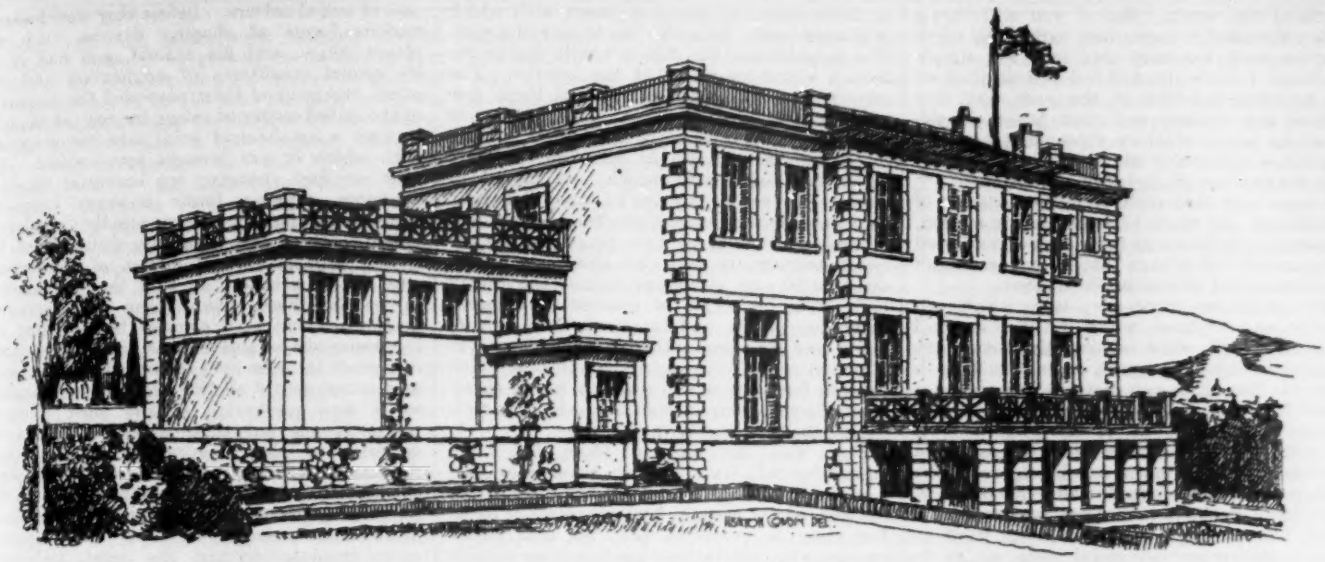
Florence. Chas. Forster Hayward.

THE PENROSE MEMORIAL LIBRARY, ATHENS.

We have already drawn attention to the scheme for erecting a memorial to Mr. Penrose at Athens in the shape of a new library and lecture-room in connexion with the British School at Athens. The accompanying plan and sketch show the proposed building, of which Mr. Heaton Comyn is the architect.

The library will form an addition to the existing Macmillan Hostel or students' house, which was built five years ago in the same grounds as the school. Mr. Penrose was the first Director of the British School at Athens, and designed the original school building, which now serves as the Director's house, so it was felt by many of his friends that it would be appropriate to establish a memorial to him in a city with which he was so closely connected for nearly fifty years. As it happens, the school library, which is steadily increasing its number of volumes, is fast outgrowing its present quarters, and, moreover, this room is found to be much too small for open meetings of the school; the committee, therefore, considered the scheme of completing the original plan of the Hostel and building a capacious room, which is to serve the double purpose of a library and room where the school meetings can be held.

The plan shows the general arrangement and necessary alterations that will be carried out. The unshaded part of the plan represents the existing Macmillan Hostel; the walls coloured black are the proposed new buildings. The new library will accommodate more than twice the number of books of the existing room, and two large studies will be gained on the first floor which will be of great advantage to those students who are taking up some special course of study. The exterior has been made to harmonise, as far as the plan will allow, with the existing part, all local materials being employed as much as possible.



The Proposed Penrose Memorial Library, Athens. Mr. Heaton Comyn, A.R.I.B.A., Architect.

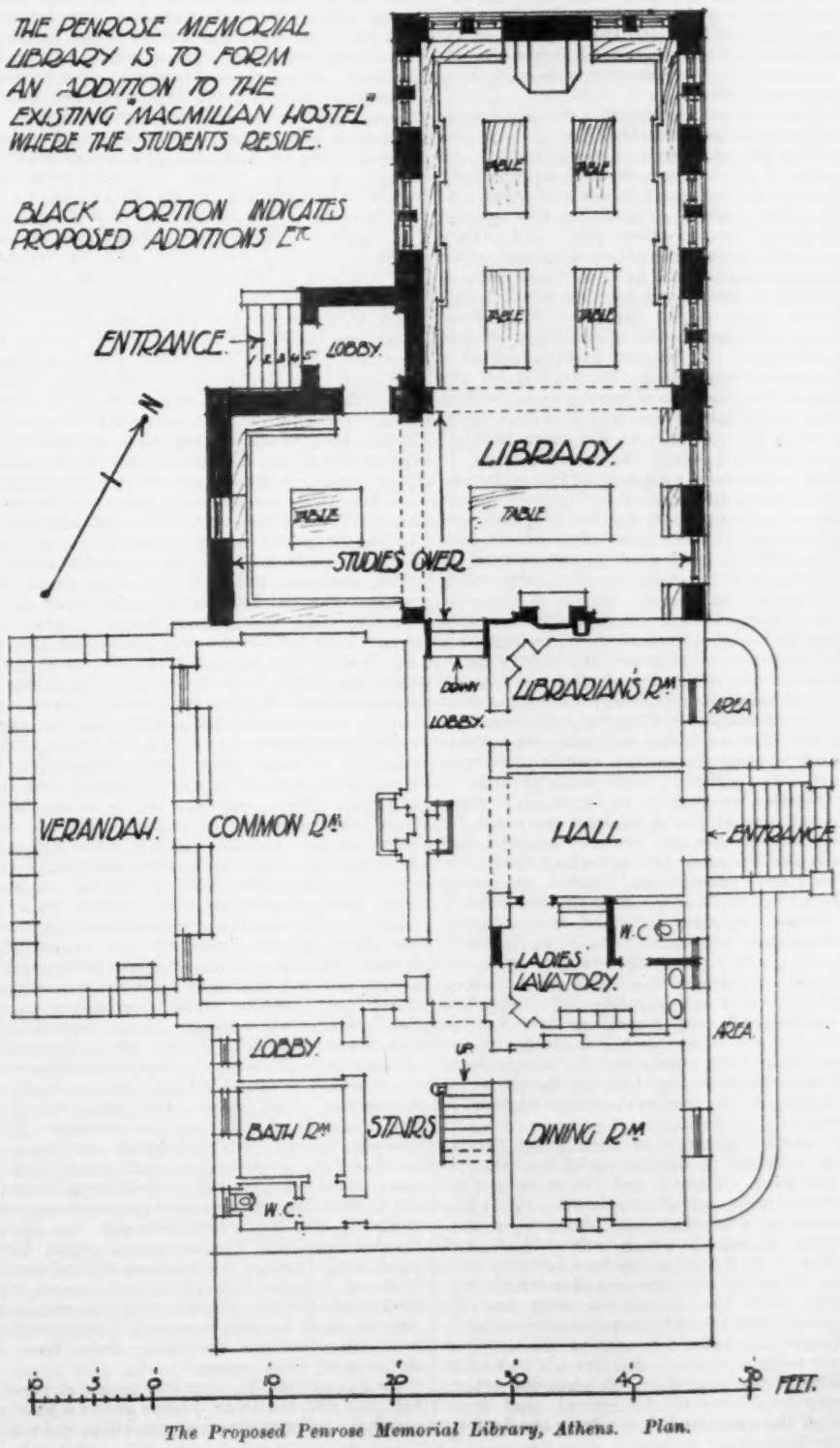
If funds permit, a portrait or bust of Mr. Penrose is to be placed in the library, the estimated cost of which, including fittings and proposed portrait, is about 1,200*l*. This, it should be added, is at Athens prices for building work, which are very low in comparison with English prices.

INVENTION.*

TO UNDERSTAND and appreciate invention aright it is necessary to have a clear view of the world of thought and work in which it takes place. One of the commonest and most fatal errors committed by would-be inventors is to view invention as if it had no past—as though the casual "happy thoughts" of those who are ignorant of what the world has already done merited its title and its rewards. From this source come most of the bitter disappointments that I have so often witnessed in my practice. We must not fall victims to any such delusion. Invention has been busy in the past, and it has left to the inventor of to-day a rich heritage of knowledge, and while he has its help in his onward struggle he has also its responsibility. The growth of mechanical science narrows as well as widens his field. It opens out to him new possibilities it is true, but on the other hand every advance in knowledge takes so much from what, up to that time, belonged to the field of invention. Nor is this only true of to-day. Even if we go a long way back into history we shall still find that the inventor had at his command a formidable armoury of weapons in the shape of mechanical arrangements and combinations which already belonged to the domain of public knowledge. I must ask you to give a little thought to this ground work of knowledge before we pass to the achievements of invention.

These elements of mechanism—approved devices for effecting definite mechanical results—were themselves originally the results of invention, although in many cases the time, the mode and the author of their introduction are all forgotten. By their intrinsic usefulness they have survived the machines in which they were first employed, and are preserved as means for special ends in whatever connexion these ends may be sought. Each represents a past achievement and a present and future power. Mankind claims to be the only tool-using animal, and if we include in the term "tool" the devices used in machinery, we may fairly say that the advance of civilisation is marked and measured by the additions to the tools he has at his command, each enabling him to do some new thing or to do an old thing better. It is in this sense that each gives him a new power. Take, for instance, the ratchet. Who first used it, and in what machine, has long since been forgotten, but from the time that it became known mankind has had the power to obtain free rotation in one direction without the risk of its being reversed. So habituated are we to this device and its effect that it may seem too obvious to be looked upon as an invention

* An address delivered to the Junior Institution of Engineers by the President, Mr. J. Fletcher Moulton K.C., F.R.S., M.P., on January 22.



The Proposed Penrose Memorial Library, Athens. Plan.

enriching the world. But if you will throw back your mind to those very early days when rotation itself was only used in a few simple machines, I think you will feel as I do that we are no little indebted to the man who first devised the ratchet, and thus put it in the conscious power of every subsequent inventor to produce rotation in one direction only whenever the needs of his invention require it.

I have said that each of these elements of mechanism, the result of some past invention, represents a present and future power conferred on mankind. It is thus that in my own mind I love to regard all worthy inventions.

You remember those fairy tales which you read in your boyhood, where the hero receives some magic gift which endows him with giant strength or lightning speed, or enables him to transport himself to any part of the world by a wish. The tale then proceeds to work out his fortune through the use of this magic power, till it ends in his marriage with the inevitable princess. This in kind, if not in degree, is the history of mankind under the stimulus of a new invention. It thereby becomes possessed of a power hitherto denied it, and busies itself in turning this power to useful ends, so as to achieve by its means some new triumph in production. The strong man of the fairy tale may be no longer found on our work-a-day earth, but the hydraulic press, by rendering well-nigh infinite pressure a thing to command, is no bad representative of him, and if it could be calculated, I am sure that the wealth it has brought to us would make even the riches of fairy realms seem trifling.

It must not be thought that simple devices such as the ratchet are all that I would have you regard as the equipment of the inventor. All elements of past inventions which have a merit beyond the special use first made of them, and which thus possess a more or less general applicability, come under this head. They include many great conceptions which ever since their introduction have been the mainstays of the inventive world, and have exercised a vast influence upon human progress. They have shaped subsequent invention by reason of their own efficiency, just as the development of a country may be permanently modified by the existence of a good line of inter-communication such as a navigable river, which renders trade easy along its course. As the most brilliant example of this I should cite the Jacquard. It first appeared about a century ago as an appendage to a loom, and it still has its most frequent employment in machines for the production of textile fabrics and the like. But this is only because such machines most frequently need its aid by reason of the character of the tasks they have to perform. In its nature it goes far beyond this special use. It puts into the hands of mankind a simple method of dealing with cycles however complicated, of elements however numerous. To realise of what it is capable you should examine a Nottingham lace machine with its thousands of threads, producing each hour lace of some varied and intricate pattern that would otherwise require months of human labour. You will then understand me when I say that the Jacquard is, in my mind, a complete solution of the difficulties produced by multiplicity of elements however fantastic and involved be the maze through which they have to wind. So general, and indeed, so nearly universal is it in its scope in this respect, that I am always reminded by it of those general mathematical expansions, such as Taylor's Theorem, which are able to deal with all functions however complex. Like them its very generality makes us take refuge in it only when no shorter and more special method can be found, but as a final resort it is always at our command, as little puzzled by the compositions of Wagner when it is used in the Pianola as by the flights of the designer's fancy when it is used in a carpet loom.

As another example of these great fundamental elements of mechanism let me take the electric relay. What is it? It is merely an electro-magnet (usually capable of being actuated by a small current and from a considerable distance), whose sole object and function is to create a contact between two pieces of metal, and thus complete an electric circuit. With this circuit the relay and its actuating current need have nothing in common; its function is confined to causing this external circuit to be completed, and the whole further working of the machinery, of whatever nature it may be, is due to the current that flows through the completed circuit from the battery or other source of electrical power with which it is connected. It is like the trigger of a gun. The propulsion of the shot is wholly due to the locally stored-up forces of the powder. The trigger or igniting spark only sets them free to work. So with the relay. This division of function leaves you free to keep your directing mechanism as delicate as you will, however great the forces with which you intend to work. The relay may be so finely balanced that the minutest current is sufficient to actuate it, and yet the energy that pours through the completed circuit may be enormous. Your machine by such means can imitate the human body with its scores of muscles of different strengths, shapes, and functions, each moving in its own way and with its own force at the direction of the delicate nerve currents which proceed from brain and ganglia, which themselves furnish none of the energy used in producing the movements they excite.

I am sure that many of those that I am addressing will have said to themselves that I need not have gone to electricity to illustrate the principle of working by local stores of force. For example, everyone who has seen steam steering gear will realise that this is an equally telling example of the principle. Instead of a dozen men standing at the wheel in a storm, as our boyhood's tales of travel used to describe, the hugest liner is steered by the pilot with equal ease be the weather rough or fine, because the function of the wheel is no longer to move the helm but to set free a steam engine to move it. But I chose the electric relay because it represents in its simplest and most naked form this principle of severing the forces of direction from those of execution. Delicacy and strength are no longer alternatives between which we must choose. We can have the giant's strength without his clumsiness.

There is a further reason why I selected the electric relay as the embodiment of this principle. It is because I wish to impress on you that in equipping himself for his task the inventor must be prepared to take all the aids that science has given him. The days when electricity was a thing apart, having no legitimate place in mechanical work, are gone for ever. No department of practical science illustrates more forcibly my simile of the fairy gifts. Consider for a moment what new powers it has brought—and from what old trammels it has freed us. A mechanician of the olden days coming amongst us now would imagine we possessed a magician's powers. His conceptions of mechanical action must have been well-nigh limited to such as depend on gearing and its analogues with all their limitations. With difficulty and with loss alone could the action of a machine be extended over more than a small space, and all its connexions must have a massiveness proportionate to the forces that actuated it. He now finds that the several parts can be actuated independently and with duly proportioned force, however widely separated in space they may be, that connexions need no longer be themselves capable of any mechanical transference of force, or be rigid or rigidly connected with the machines they actuate. He is even freed from the necessity of contact between the parts of his machine. Action at a distance is at his command through the medium of the electro-magnet, so that one part of his machine may actuate another part without physical contact. He can thus, when he wishes, turn the flank of his persistent and implacable enemy—friction. In an exquisite writing telegraph, which I saw some time ago, an escapement was used in which the anchor never touched the teeth of the escapement wheel, the whole actuation being electro-magnetic, so that the parts when they approached seemed fendered off by invisible hands that they might not collide. And, in the near future, we have the promise of still greater freedom. The Hertzian waves give us control at distances far beyond any mechanical needs, and already many inventors have schemed out how by their aid to direct and set in action torpedoes moving freely in the sea. And although the forces thus transmitted are so minute that they must work through the medium of local stores of force, it is not beyond hope that even this limitation of our powers will be overcome and we shall be able to supply to mechanism both direction and actuating force from a distance by these means.

As an example, how new mechanical elements, bringing with them new powers and new liberty, give rise to new types of machines, take the case of milled cutters. Before they were known various forms of shaping devices, such as plane, gouge, and file existed, and had each its special conditions of application and its effect, but none of them possessed the property of the milled cutter of eating its way (as though it were a mechanical acid) into the material with which it was brought into contact. At once we find springing up universal shaping machines copying forms however irregular merely by having these rapidly revolving milled cutters—like dentist's drills—fixed in frames capable only of motion of translation and not of rotation, so that they all moved in parallel lines, maintaining their relative positions. One such element is a dummy of the same shape and size as the cutters, and it is made to move over the object to be copied, and consequently all the others, being parallel to it and preserving strictly their relative positions, eat out their respective blocks of material to the same shape. I remember first seeing such a machine at work on shaping the clumsy sabots of French peasants. With requisite refinements of mounting and general mechanical arrangement it is now copying with absolute fidelity the most elaborate statuary. Whether the work be rough or fine, the principle is the same. Once you realise that your live cutter will eat out where it touches you have only to make it imitate in its movements the dummy that feels over the whole surface of the object to be copied to insure that it will reproduce that object. But not only the idea but the possibility of such a machine sprang directly from the introduction of the revolving cutter.

I have, perhaps, lingered too long over the equipment of the inventor. Let me now turn to his task. I shall not attempt to include the whole domain of invention in my remarks. It is too varied and too vast. I must limit myself to some one type, and accordingly the class of inventions which I have chosen are those whose object is to produce, by mechanical means, articles that otherwise must be produced by hand work. This, in itself, would be an idle feat if the new method did not effect its purpose better or cheaper or more swiftly than that which it is to supplant, and it is the machine which accomplishes this most thoroughly that will ultimately succeed. It is this necessity of efficiency in the invention which brings it about that before designing his machine the inventor has a preliminary task set before him, on the right performance of which his success mainly depends, and which is calculated to try to the utmost his inventive faculty.

Take any hand operation—say, for instance, sewing. Ages of experience have authoritatively decided the easiest way to perform it, and this solution is found embodied in the practice of to-day, and has probably remained unchanged since the Stone Age. But this solution is the correct one only when we are working with such means as Nature supplies to man. With two hands, whose movements are closely watched by eyes which report to a guiding intelligence, you can find nothing better than to have a needle pointed at one end and pierced with an eye near the other which carries a moderate length of thread from one side of the fabric to the other, and serves as the instrument through which adequate tension is applied to the stitch to make it tight and even. But in passing from the hand to the machine you lose some capabilities and gain others. Direct information of so comprehensive a character as the seeing eye can give to the mind would be as hard to attain in mechanism as it would be to frame the complex orders which flow therefrom through the action of the intelligence and to secure obedience to them. Yet though we must resign ourselves to the loss of much, there are compensations for what we lose. The human being has but two hands, and it is only by long practice that it can attain to the perfectly independent use of them. In machinery we have no limits as to number or independence of action. We can construct a Briareus, each of whose hundred hands will perform its appointed task without interference or distraction from the existence or the working of the others. Skill in the sense of trained judgment may be hard to imitate, but skill in the sense of accuracy of work is at our entire command. Obedience will now be blind and unreasoning, but it will be implicit and untiring. It is not my purpose to balance these advantages and disadvantages and show which scale goes down. My object is to

point out that, under such changed circumstances, there is no ground for assuming that the mode of performing the operation that has been proved to be the best for hand work will be the most suitable for doing it by mechanism, and the first task of the inventor, therefore, is to decide whether he will adhere to the hand cycle or will rather substitute for it some equivalent cycle producing the same results but better suited to the new conditions—to the strength and weakness of the inanimate.

Let me take an analogy. Doubtless, you have often had to send a message by telegraph to some distant country to which the rate charged per word is high. You write your message as tersely as may be, but even thus its length is formidable. What do you do? You fly to your telegraphic code. It tells you that if you will change the phraseology of your message you can by a single code word represent a whole phrase. You thereupon set to work to recast your message so as to make it capable of being expressed in code words. When you have done so you have not improved it as a message. It is less terse and less naturally expressed. If you were writing and not telegraphing you would prefer to use it in its original form. But as now expressed each of the phrases of which it is composed can be sent over the wires in the form and at the price of a single word, and the cost of the whole is but a fraction of what would have been the cost of your message as originally framed. It has been recast in a form suitable for cheap telegraphing.

Just so the inventor. He has to find a series of operations which in their totality are equivalent to the series of the hand worker. But each of these operations in itself need not be such as would in hand labour be suitable or even practicable. It is necessary and sufficient for him that they are suited to the new conditions, *i.e.*, that they can be well and easily done by mechanism, and that, taken as a whole, they produce the same result as the series which he is paralleling. He is rewriting the series in terms suited to mechanism just as the message was rewritten in terms suited for telegraphing. The meaning of the message must remain the same but the terms used to express it are no longer those most naturally used in writing or speaking, but are those which can be telegraphed at least cost.

To make my meaning clear let me revert to the familiar operation of sewing. I have described the hand process and pointed out how it is unsuited for mechanical reproduction. How is it to be translated into an equivalent cycle suitable for mechanism? In other words, how is it to be "coded"?

This case is interesting, inasmuch as we have two independent solutions made at different dates and widely different in nature. The earlier invention imitated the hand cycle very closely. The thumb and finger of the right hand in the human being were replaced by pairs of pincers capable of taking hold of the needle and letting it free again, but to avoid having to follow the intricate movements of the human fingers in the operation two pairs of pincers were used, one on each side of the work, which passed the needle backwards and forwards through the fabric one to the other. Following out this idea the needle was pointed at both ends with an eye in the middle, and, as in hand sewing, it carried a moderate length of thread. The pair of pincers which held the threaded needle advanced to the fabric and passed the needle through it to the other, which took it and retreated so as to draw the stitch tight and form the completed stitch. To form the next stitch the work was moved through the proper distance and the same process was gone through, the line of movement of the needle always remaining the same.

There is not much "coding" here. The new cycle imitates the hand-worker so faithfully that it benefits little by the advantages of mechanical action. As in hand work it can only sew with moderate lengths of thread, and must therefore have the needles re-threaded at intervals. Its superiority over hand labour is therefore so slight that it is doubtful whether such a sewing machine could ever have competed with, much less replaced, hand work. But it has one great merit. The needle mechanism is capable of being re-duplicated almost without limit, and the movement of the work which is necessary to make the stitches for one needle will serve equally well for any number of needles working parallel to it. Hence the machine that would have failed as a sewing machine has survived and proved useful as an embroidery machine. The work is stretched between two rows of pincers and moved by the workman according to the stitches of the pattern. Each stitch is repeated by each of the parallel needles, which work side by side at convenient distances, and thus as many copies of the pattern are simultaneously produced as there are needles. Each is a perfect facsimile of all the others, and as each copies faithfully the errors of the workman, this machine is entitled to the proud boast that its productions possess all the defects of hand work—an essential we are told of artistic beauty.

What is the cause of the comparative failure of this attempt at a sewing machine? It is evident that it is due to the retention of the feature of the hand operation by which the needle is passed from one holding mechanism to the other. The inventors of the modern sewing machine, on the other hand, decided to work with a needle fixed in its holder and never leaving it throughout the operation.

It at once followed that the needle and thread must, on the back stroke, return through the same hole through which they had entered the fabric, so that no stitch could be formed unless some obstacle were interposed to the return of the thread. Here the two famous and successful forms of the machine parted company. Both placed the eye at the point of the needle that the stroke might not be needlessly long, but while the lockstitch machine used a second thread to provide the necessary obstacle, the chainstitch machine (by means which I need not describe) availed itself of a loop of the original thread for that purpose. Thus in the lockstitch machine the substituted cycle has become as follows:—

(1) The work is moved under the needle for the new stroke.
(2) The needle (which has an eye at its point through which the thread passes) pierces the fabric carrying with it the thread.
(3) A second thread is passed between the thread and the needle (by means of a shuttle or its equivalent) when the needle is at its lowest position.
(4) The needle returns while a take-up retracts the thread so as to tighten the stitch.

This cycle would, for hand work, be immeasureably more complicated and difficult than ordinary sewing, but it consists of operations mechanically easy of performance in swift and accurately timed sequence, and, as the whole of the thread in use has no longer to be passed from one side of the fabric to the other as each stitch is made, it has brought with it the all-important advantage of our being able to work with a continuous thread. Here, then, is a magnificent example of "coding." It is not to be wondered at that the machines which it has given to the world are in well-nigh universal use, and have profoundly modified both our social and our industrial economy.

You see that I have hardly touched on the actual mechanism to be used for performing the several operations of the coded cycle, and it is not necessary. In such a case as this the invention practically lies in performing the operation of "coding" aright. It is this that explains what you so often see in the history of an invention, viz., that everything appears to come from the adoption of one special element which thereafter forms a part of all machines for that purpose. Thus it is sometimes said that the invention of the sewing machine consisted in putting the eye of a needle at its point. In a very real sense that is the fact. Such a needle indicates and embodies the fundamental changes of the cycle in which the real invention consists, and the adoption of such a form of needle implies the adoption of this new cycle. A similar example of a single element expressing the essentials of the solution of an inventive problem is to be found in knitting machinery. The dexterous guidance by eye and hand of the knitting needles or the crochet-hook, so as to draw the thread through the old loop to form the new one without risk of letting it slip or of fouling the old loop, was hard indeed to imitate mechanically. It was the realisation that we must avoid the difficulty by turning the hook into a needle with a closed eye during that part of the substituted cycle, while it remained an open hook during the rest of the time, that solved the enigma. It is a minor matter whether this is effected by giving it a flexible barb, which is pressed to the shank by external means, or whether it is done automatically. The core of the invention is in the use of such a needle, and this has given to us the machines which now take so large a part in the manufacture of clothing.

It is not only in great inventions bringing into the realm of mechanics processes so important as those to which I have referred that the need of "coding" exists. It figures at the birth of most really successful machines. And there are types in which the whole invention may be said to consist in the choice of a cycle. Take for example the processes of shaping metals by pressure, the rapid development of which has been so characteristic of the last twenty years, and the promise of which is so brilliant for the future. In them the metal is treated as a highly viscous substance, and the aim is to make it assume definite and often complicated shapes through pressure alone. If this is well done the strength of the material itself throughout all its parts is increased. If not, the resulting article is weak and unreliable. The whole success of the process in its application to the more complicated forms depends on the judicious choice of the series of intermediate forms through which the metal is made to pass. You are dealing with substances so resistant that all attempts at sudden or violent transference of material from one conformation to another must result in weakening or rupture. The series must, therefore, be such that each step entails a transference under suitable and advantageous conditions. It must leave the material in the position best suited for the next step, as a good billiard player takes care that the balls shall be left so as to make his next stroke an easy one. To design successfully such a process may involve invention of a high order, even though the execution makes use only of ordinary tools.

When the transformed cycle has been determined upon, there remains the task of providing the means for carrying it out—in other words, the designing the new machine. On this part of the subject I shall not dwell because the devices which human ingenuity makes use of to effect its objects are so multifarious as to defy classification. Nor does the progress of invention come to an end when the machine has been devised. It then becomes the subject of further invention, the aim of which is to arrive at better results by modifying or changing or adding to the mechanism. This is the most common type of invention. Long after a fundamental invention has been made and embodied in some form of mechanism new inventions will appear, which are, or claim to be, better methods of carrying it out in general, or which adapt it to be used with more effect in special circumstances. Such subsidary inventions usually consist in the substituting for the mechanical devices originally used other equivalent devices better suited to the work which they have to perform, the machine in its essentials remaining unchanged. And though this judicious adaptation of means to ends may seem less brilliant and interesting than such inventive efforts as we have been considering, it is hardly less useful. To increase the output of a machine or make a delicate machine equal to rough work is no mean achievement, and may vastly extend or even create its practical usefulness.

It is here that the lawyer's difficulties are greatest. The benefits of the Patent Laws are confined to inventions, and it therefore becomes necessary, in deciding whether a new machine or a modification of an old machine is good subject matter for Letters Patent, to put to oneself the question, "Does it involve Invention?" The decision is not difficult when it involves a new cycle or a wholly new mechanism for accomplishing an old cycle. But when it consists of an improvement on old mechanism by the substitution of different but equivalent devices the task is one of great nicety. It would seem to be necessary to fix upon some definition of invention, but this has never been done, and in my opinion no definition of invention can be found which is of the slightest assistance to anyone in a case of difficulty. It is very much like deciding whether a book belongs to literature. No one would deny it in the case of Ruskin's "Modern Painters," or assert it in the case of "Bradshaw's Guide." These extreme cases are easy of decision, but when you approach the dividing line it is so impossible to get a test that it becomes, more or less, a matter of personal opinion. Some of the elements of a combination are altered so as to improve, but not essentially change, its working. Is that a new invention? If it is only the substitution of mechanical elements

which are notoriously the equivalents of the old elements the law is clear, but in any other case it is treated as being a question of fact for the judgment of whatever tribunal has the duty of deciding. Our Courts, in this, as in many other questions, lean to the practical rather than the dogmatic. They impose no rigid test such as that to which the German Patent Office inclines, viz., that the new combination must produce a different technical result. To do the same thing better, or in a way so different that it gives to the public a useful choice of means, may with us be sufficient to support the claim to invention. And I have little doubt that if a case should arise in which a judicious selection out of the list of known and notorious mechanical equivalents gave an unforeseen and markedly superior result the Courts would consider themselves free to hold it to be invention, and, in treating the decision as thus dependent on the resulting utility, they would only be following the dictum of Lord Watson: "There are many things which you cannot say are, or are not, inventions till you have tried them."

"Have something to say, say it, and sit down," was the reply given by a Parliamentary veteran to a new member who asked for advice as to how to speak. How often have I wished that inventors would take this counsel to heart in all its fulness. They often have something to say and they say it, but they will not then sit down. It is not that I would have them rest on their oars, but I would have them bear constantly in mind that the value and the reward of an invention comes when it has been made practically serviceable to mankind, and that the invention itself is but the first and perhaps not the most difficult step in the process. Careful and patient development along commercial lines is necessary before an invention, valuable in itself, becomes a useful part of our system of production, and here the enthusiasm and knowledge of the inventor would be invaluable if it were well applied. I am one of those who believe that *cæteris paribus* the mother is the best nurse. But, alas, this is where inventors so often fail. They are never content to work out practically what they have invented. Fresh inventions are their remedy for every difficulty, even for such as naturally occur in all industrial developments, and thus perpetual change leads to delay, loss, and final abandonment. "*Le mieux est l'ennemi du bien.*" ("The better is fatal to the good.") I remember that many years ago I was taken to the workshop of Mr. Babbage, of calculating-machine fame. He was then an old man, with a most remarkable past. A distinguished mathematician when at Cambridge, and a leader among those who rejuvenated its teaching—a man of comfortable fortune and untiring industry—gifted with great inventive powers, and living for them alone, one would have expected in his case to find all the marks of a rich harvest of achievement. In the ante-chamber I recognised parts of the well-known calculating machine that many years before he had brought to the stage of actual working, and I asked him as to its completion. "Oh, I have done no more at that," was his reply. "Before finishing it I conceived the idea of my analytical machine, which was so much better that it would have taken more to complete the first machine than to make the new one." We then came to the analytical machine, parts of which were lying about, and he explained to me its principles and mode of working. "Have you got it finished?" I asked. "No," he said, "for I have come on a new idea which throws it so completely into the shade that it would be mere waste of time to work further on it." And then he explained to me this new idea that was to revolutionise even the world of advanced thought in which he lived. No comment of mine could be so weighty as the plain recital of what occurred when this richly gifted life came to an end. A committee of our ablest mathematicians and mechanicians was appointed to examine the models and papers that Babbage had left behind in order to ascertain whether Government would be justified in completing his work at the public expense. The report was that all was too incomplete—that no one could foresee success with sufficient certainty to warrant the attempt. So that a fragment of a machine, the work of his early years, is all that his abilities and his industry brought forth.

It is not only men of the teeming brain of a Babbage that leave their work in this incomplete and useless state. It is the most common fault of inventors. They have not the patience to develop their inventions to the stage of practical reliability, and they leave them useless except to testify to the ingenuity of the mind that devised them. I suppose that I, of all men, should feel sympathy with these unrewarded workers, but I confess that in my secret heart I consider them an almost unmitigated nuisance. They accomplish nothing useful themselves, and they detract from the merit of those who, by greater perseverance and more patient labour, have succeeded where they failed. Their inventions attain posthumously a short-lived forensic glory by being paraded as anticipations of some later invention that has proved itself of sufficient value to be worth defending. The resemblances are pointed out in order to discount the originality of the successful invention, and oft-times it has to be admitted that the kernel of the later invention is to be found in its predecessor. But I am happy to say that when an inventor is modest in his claims and seeks only to protect that which he has in fact made practically useful, the tendency of the jurisprudence of our country is to pay little heed to antecedent incomplete or useless attempts. I have long contended, and I think it is now settled law in our Courts, than an invention is not made until it has been developed so far that the normal result of its working is success. Uncertainty in result beyond this point means practical uselessness, and as it in fact leaves the field still unoccupied for future inventors, so it should do in law, and their fame and their reward should not be lessened by the useless half-successes that have preceded them.

I shall be told that I am too hard upon the inventor in holding him responsible for commercial non-success. It will be said that the practical development of an invention is not the business of the inventor, and that the qualities of mind that characterise him unsuit him for the task. Unvarying repetition is the key to commercial production, while the inventive genius yearns for change. There is much truth in this, and the strongest and most successful combinations are those in which both elements are represented in different individuals, the more practical being the dominant one. It is in this that we are so far behind our great rivals—Germany and the United States. I am not going to weary you with a description of the laboratories of research which exist in all the great chemical works in Germany. This has been so much dwelt upon of late that I only refer to it in passing as an eminent example of this union of invention with a system of practical development. But what is not so widely known is that in the United States the same thing is done in connexion with mechanical inventions. Men possessing inventive genius of a high order are maintained as part of a business organisation for the express purpose of making inventions which, when made, are duly tested and, if found of practical value, are exploited on a large scale, the inventor reaping thereby his reward. It is by this that I explain the fact that the successful machines of to-day, and more especially those of a complex type, or that form elements of a series, are mainly of American origin. I see no reason to think that we are individually inferior to Americans in inventive faculty, but unquestionably English capital is, as a rule, in less enterprising hands. Our great business firms are inclined to put off taking up new inventions until competition has forced them to do so, and they are still less disposed to look on invention as forming an essential part of business. In saying this I must not be supposed to be applying the criticism to all. Happily there are amongst us most brilliant exceptions, but the tendency of the successful among us is to rest in the old ways while our great rivals are throwing so much of their strength into the discovery of new ones. It is in consequence of this that the development of new inventions in England falls so much into the hands of limited liability companies specially formed for the purpose, and this is far less likely to bring success than if the inventions were developed by existing firms or companies. Joint stock enterprise of the commercial type is so far inferior to individual enterprise that it rarely succeeds, unless it is the embodiment of the individual work of one or two individuals, and in the case of companies specially formed to work inventions it too often happens that the management of the company is in the hands of the inventor himself, who possesses little or none of the commercial training necessary for success. In looking back I can think of no few inventions which, in wise hands, would have produced enormous returns, but which have, for these reasons, produced little or nothing even if they have not been a source of loss.

In what direction is invention trending? In two directions which are well-nigh opposite or, I ought rather to say, complementary the one to the other. On the other hand the tendency is to divide manufacture up into many simple operations, each capable of being performed swiftly and well by a special machine designed solely for that purpose, and thus working under the most favourable circumstances for cheapness of production. Take, for example, the manufacture of machine-made watches—a manufacture which I am happy to say, is at last being vigorously taken up in England, after we have so long allowed ourselves to be distanced by our foreign competitors, both commercially and inventively. Each machine employed has only a minute operation for its share of the work, several being needed to perfect each piece. But these machines are so nearly automatic that the labour required for the most part needs no skill, and the rapidity with which they work makes the actual cost of production almost incredibly small, while the accuracy of the workmanship can be, and is, brought up to a pitch which completely satisfies all requirements of practical use. This tendency to sub-divide the operations of production until they are each capable of being performed either automatically or with unskilled labour, is having momentous effects in labour questions. Strange to say, increase in accuracy of workmanship is tending to increase the demand for unskilled labour. The skill which used to be sought for in the workman is now embodied in the machine. This is due to what I may term the uniformity of mankind. The chief wants of each class are common to all the individuals that form it. Hence any rise in the standard of comfort of a nation produces a demand for millions of articles of one and the same class, precisely such a demand as can be best satisfied by the unvarying but economical production of machines of the type of which I have spoken. I have no doubt that the growth of production as a whole will be so rapid that the total demand for unskilled labour of all sorts in manufactures will not actually diminish, but I am equally sure that, relatively to substantially unskilled labour, it will be less and less used. Rough and brutalising labour will be done away with, but its place will be taken by unskilled rather than skilled labour.

For you must remember that precisely that process of "coding" of which I have spoken is being applied to bring each operation in production within the reach of unskilled labour. Take, for example, machines that are used in domestic or trade life (such as typewriters, sewing machines, etc.), and which are produced in such vast numbers. Inventors are hard at work modifying the construction or configuration of each piece of these machines so as to lessen the cost of its production—to enable it to be made by some cheap process which dispenses with hand work and skilled labour. I have known a company in America, before they sold a single machine, spend two years and 20,000*l.* in modifying the parts and their arrangement till each could be made by stamping or some similarly cheap method at a minimum of cost. And you must not forget that, if wisely done, this relegation to automatic machines and unskilled labour is an advantage, because it brings with it as a consequence absolute interchangeability of parts, which diminishes so vastly the cost of repairs.

Side by side with this tendency towards highly-specialised machines, each doing one small and separate operation, there is the other line of invention, i.e., of machines which combine—I would prefer to use the mathematical term, "integrate"—a whole series of successive operations and turn out a completed article. Here we find perhaps the greatest inventive triumphs of our time. Take, for instance, the linotype. Type-setting, type-founding, and casting blocks of type as in stereotyping, had all been done by hand, and to a great extent mechanically, before the linotype came in. But it united them all in one machine, and enabled an operator, with little greater labour than in working a typewriter, to produce the set-up type cast in lines ready for printing.

It is difficult to say which class of machine is attracting most attention—whether combination or division of operations, synthesis or analysis is taking the lead. If success is completely attained, the machine that combines in itself the whole series must always gain the day. But the penalty for falling short of perfection is

heavier and the danger greater. Each step brings its own liability to failure, and the failure of a step has more serious and more far-reaching consequences. Yet we have abundant proofs on all sides of us that human ingenuity is equal even to this task. Here again the effects of the systematic pursuit of invention in the United States show themselves most markedly. Few private inventors have, unaided, the means or the time to work out such complex problems. Mergenthaler, the inventor of the linotype, spent years of incessant labour before he came to a practical result. Plan after plan was devised by him only to be rejected, because the success it brought was too incomplete. At last he succeeded, and he and those who had supported him had their rich and deserved reward. This is but one of many instances that could be given. I wish that it were easier to parallel them in this country.

Those whom I am addressing are chiefly in the early stage of their professional career. How do I wish them to regard invention? Should they all aspire to a share in it, or is it to be reserved for a chosen few?

To answer this question I must go back a little and recall to your minds the aim of invention. It is to enable mankind to do some new thing or to do an old thing better or proper or more swiftly. It is accomplished by a more judicious adaptation of means to end. If we cease troubling ourselves about the arbitrary line, which for certain legal purposes is drawn so as to delimit what is invention, we may look on all those who are engaged in improving mechanical appliances and in advancing practically mechanical science as fellow workers in one common field. In this sense you may all hope to be inventors, and it is this conception of your calling that I would impress upon you. Don't seek originality or change for its own sake. Have a single eye for efficiency and be content with the work of others until you can surpass it—remembering always that well-trodden paths are easiest to follow and that it needs some substantial gain to warrant your leaving them. But never lose the hope that you may be able at some time and in some way to help the advance of science by some contribution of your own which may merit in every sense the title of invention.

Is this wise advice? Can one allow oneself to taste the fascinations of invention and not be led astray into fruitless and desultory quests after some new thing? The danger exists only for those who are superficial in their work. The wider and more thorough is a man's knowledge the less likely he is to over-rate his own powers and by thinking himself a universal genius be led to waste his life in futile efforts to do everything. Indeed the danger is rather that he will be too much discouraged. He will find that so much has been done so well by others that he will despair of accomplishing anything new that is worthy to be ranked with it. But a little discouragement will not hurt him so long as it does not lead him to abandon the training that is to prepare him for the moment when he finds his right task.

And here let me put in a word as to this training. I am not going to enter upon the vexed question of Technical Education. I am going to remind you of the metaphor I used when I compared invention in a machine to literary merit in a book. I want you to look upon famous inventions as a scholar looks on the works of our great authors. He reads them not only to enrich his vocabulary but to teach himself consciously how those words can best be used. You cannot read an essay on Macaulay without learning something more of the powers of our language. So is it with the machines of the great inventors. They are your literature. You cannot master their construction without getting a firmer hold of the resources of mechanical science. My advice to you is study your machines. Never miss an opportunity of examining those whose merit is established and which have played a great part in the world of industry, even though they may not belong to your special branch. Try to appreciate the task their makers had set before them and the steps by which they performed it. I shall never forget the occasion when the late Professor Hughes explained to me his Printing Telegraph, and narrated how he spent two years in seeking for a vibrator that would answer the demands he must make upon it in speed and regularity, and how his wife's knitting needles at last suggested the solution. On this basis he built up an instrument every detail of which was so well thought out that its complexity and delicacy made it more and not less suitable for the strain of daily use. I wish I had time to take as example this or some other glory of practical science and show you how the great inventors overcame or evaded difficulties; how they at times persevered almost to obstinacy, and at other times threw away all the results of years of labour because they saw success attainable in another direction. But you will find out all these things for yourselves if you will but study great inventions, and, while the study makes you feel humble before those who have done such marvels, it will leave you all the more eager to emulate their achievements.

And remember the future is in the hands of the inventors. No invention can live that does not cheapen production—*i.e.*, that does not lessen the amount of human labour needed to produce a given result. Hence the ratio—if I may use such a phrase—between labour and its results is ever increasing with the progress of invention; indeed, if we take the word in its broad sense, we may rightly say that this ratio is fixed by invention. This ratio, which represents the fertility of labour, measures the wealth-producing power of the world. It defines the amount that the individual can contribute to the common store by his own labour, and conversely it limits the share which he may hope to receive from that store. You will think me too optimistic in putting the proposition in this its converse form. We know that too often what a man receives differs widely from what he contributes by his labour. Creation of wealth does not necessarily bring with it distribution. But in this respect invention is on the side of the masses. Production is aided by it only on terms of the uniformity of the article produced. Hence the characteristic effect of invention is to bring within the reach of the many that which previously belonged only to the few. Lace that princes alone could have possessed comes within the means of the moderately rich. Stuffs that only the wealthy could have procured are worn by those who have to earn their daily bread. Thus products of manufacture under the influence of invention become accessible to an ever wider and wider class. It has responded to the demands for a higher standard of comfort, and it stands ready to respond to whatever such calls are made on it in the future. If it has not done more it is because mankind has been too easily satisfied with lower pleasures, but with the growth of education and the spread of civilising influences of all kinds we trust that this will be so no longer. And I can wish no better future for those whom I am addressing than that they may be sharers in those triumphs which future still holds in reserve for invention.

THE LONDON COUNTY COUNCIL.

THE usual weekly meeting of the London County Council was held on Tuesday in the County Hall, Spring-gardens, S.W., Lord Monkswell, Chairman, presiding.

Loans.—On the recommendation of the Finance Committee, it was agreed to lend Deptford Borough Council 10,000*l.* for erection of town hall; Guardians of Greenwich Union, 21,700*l.* for poor law purposes; Hackney Borough Council, 7,406*l.* for electric light installation, and 1,560*l.* for paving, etc.; Paddington Borough Council, 5,219*l.* and 2,566*l.* for payment under Boroughs of Paddington and Chelsea (Adjustment) Scheme, 1903; and Stepney Borough Council, 1,998*l.* for street lighting purposes. Sanction was also given to Paddington Borough Council to borrowing 5,334*l.* for street lighting purposes.

The Works Committee.—The adjourned report of the Works Committee, giving a statement of the works completed during the half-year ended September 30, 1903, was then considered. The Committee reported as follows:—

In Statement I. are included the accounts for 20 works completed in the half-year in respect of which specifications and bills of quantities have been prepared. On a few of these works some small expenditure has been incurred after 30th September last, but all such expenditure has, of course, been brought into account. The extension of the Westminster gas meter testing-office, the accepted estimate for which was 7,000*l.*, was completed during the half-year, but, as the cost account of this work is amalgamated with that of certain repairs at that office, we are unable to include this work in the statement now submitted, and it will, therefore, appear in a future statement. The total cost of the works included in the statements does not represent the turnover of the department, because much of the expenditure on these works occurred previous to the half-year in question, while, on the other hand, much of the expenditure during the six months was upon works which are still unfinished. The approximate expenditure on works executed by the department during the half-year was 187,000*l.* We are glad to be in a position to state that the net result of execution of the works included in the statement is a balance of cost below final certificate of 25,863*l.* 9*s.* 5*d.*, or about 11·114 per cent. on the total of the final certificates, and that 19 out of the 20 works have been carried out at a cost below final certificate. We are, moreover, of opinion that, in the case of works Nos. 4 [Rotherhithe Fire Station] and 6, [Mile-end Fire Station] the balance of cost below final certificate would have been greater but for circumstances quite beyond our control. . . .

In the case of the erection of Rotherhithe fire sub-station (No. 4) we accepted the work on condition that free use of the river frontage and wharf would be accorded to the Works department, but, owing to delay in the completion of the execution of the gridiron in front of the wharf, it was not available for use by the department during two-thirds of the contract period, and the heavy materials had consequently to be carted on to the site. This, in itself a considerable item, was rendered more costly through the peculiar character of the site, which is practically insular at high water, owing to the position of the entrances to the Surrey Commercial Docks. The erection of the sub-station was, however, completed within the time stipulated by the architect. In the case of the enlargement of Mile-end fire station (No. 6) work was delayed under orders from the architect, owing to questions of right-of-way and party walls, and about two months' delay was thus caused. The Council will readily understand that any delays of this nature have a far-reaching effect upon the cost of the work, and are very difficult to appraise in the settlement of the accounts, and nothing has been credited under this head in the final certificate. The erection of Lots-road pumping-station (No. 17) has been in hand since April, 1901, and, as it was practically complete some time ago, we have included the account for the work in the statements now presented, an addendum account being opened for the few minor works remaining to be done. For some months past the expenditure has been mainly confined to labour in attendance upon the contractors for the pumping machinery, and until this is in complete working order some small weekly expenditure will be incurred, the value of which will be certified for separately by the engineer, and the account for which will be included in a future statement. The figures now presented are therefore comparable. . . .

The number of works in respect of which full specifications, bills of quantities, etc., have been prepared, and which have been referred to us for execution and not yet included in the half-yearly statements of completed works submitted to the Council, is 36, representing an estimated expenditure of approximately 941,000*l.* As required by the standing order, we have to report that, in the case of the construction of the relief sewer from the southern high level sewer extension at Balham High-road, the sum of 5,940*l.* voted for the work may be exceeded, but this is the only work on which, at present, an excess is anticipated by us. . . .

Mr. Torrance, Chairman of the Works Committee, said the report was highly satisfactory. He was still in favour of the Council doing a considerable part of its own work, although he had nothing to say against the contractors as contractors. The Council had to get the best work, and he challenged anyone to say that the work of the Department was not as good in every respect as that of contractors. The continuance of the Department was in the best interests of the Council.

Mr. E. Collins said that the Department was insolvent. If the Council had faith in the Department, why did they not make it tender with the contractors? There were no assets to pay for the 80,000*l.* of loss which had been incurred. As an instance of the way the Department carried on its work, he might mention that they were charged 117*s.* for best wire-cut bricks, and he had a quotation for the same thing for 56*s.*

Mr. Beachcroft congratulated Mr. Torrance on his satisfactory report. The Moderate Party were not blinded by prejudice, and the Council was to be congratulated on the report. Mr. Torrance did not pitch his success too high, and tell them that all the loss had been wiped off, but only that 25,000*l.* had been saved to set-off against the loss. The result showed that a thoroughly sound business man was required to be at the head of an undertaking of this kind if they were to succeed.

Mr. Howell J. Williams said that Mr. Collins had misunderstood the facts as to the bricks. The price quoted was for bricks delivered at Willesden Junction, and the account charged by the Department was for bricks delivered at various small jobs, in small quantities, in various parts of London.

Mr. H. P. Harris said he did not dispute that the present arrangement was working well, but they must not forget that there had been three periods in the history of the Department, and that the first two had been failures.

Mr. McKinnon Wood said he agreed with the last speaker; but he must remark that the first two phases were forced on them by the Moderate Party, and it was not until the Progressive Party had their way that the Department had become a success.

The report was then adopted.

Drury Lane Theatre.—The Theatres and Music Halls Committee submitted their report in reference to Drury Lane Theatre, part of which we printed in our last issue. The Committee recommended:—

That a notice under the 45th section of the Metropolitan Board of Works (Various Powers) Act, 1882, containing the following requirements, and specifying 28 days as

the time within which they are to be complied with, be prepared by the solicitor; that it be sealed in duplicate, and be served upon the person or persons by whom the premises, known as Drury Lane Theatre, are kept open for public entertainments—

(a) That all doors and gates affording means of exit from the said premises shall be thrown open at the conclusion of each performance, and shall be kept open during the departure of the public from the premises.

(b) That all such doors and gates shall be fastened during the time they are authorised to be closed by automatic bolts only of a pattern or patterns which shall have been approved for the said doors or gates by the Council.

(c) That such doors and gates may be closed during the times fixed for the admission of the public to, or the presence of the public in, the said premises, on condition that there shall not then be upon any such door or gate any fastening other than an automatic bolt, in proper working order, of the pattern approved by the Council for such door or gate, and on condition that on every occasion when the said premises are open for the admission of the public each of such doors or gates shall, immediately prior to the admission of the public thereto, be fully opened and closed again for the purpose of ascertaining that the same is in proper working order.

(d) That all exit and other doors used by the public shall be indicated by painted notices in 7-inch letters, such notices to be painted on the doors and walls, at least 6 ft. 9 ins. above the floor, and that such notices shall not at any time during the time fixed for the admission of the public to, or the presence of the public in, or the departure of the public from, the said premises be in any manner, or in any degree whatsoever, obscured or hidden from the view of the public.

Sir Algernon West, in moving the adoption of the report, said there were two theatres in London which were not under the general jurisdiction of the Council—having been in existence at the time of the Restoration—namely, Covent Garden and Drury Lane. The directors of the former had moved with the times, and had at vast expense done everything which the Council considered necessary for the public safety. With regard to Drury Lane, he suggested that the letters which had passed between the directors and the Theatres Committee should be put in the agenda paper next week, and he thought it would save time if he stated at once that in their last letter the directors had come to the conclusion that they would do all the Council required them to do, or they would submit to arbitration. The Theatres Committee would be quite willing to submit anything to the arbitration of an arbitrator nominated by the Office of Works. If the directors would do that, the Committee had nothing more to say, and it would obviate a great deal of useless discussion. If the directors agreed to carry out all the Committee's requirements there would, of course, be no need for arbitration.

Colonel Probyn said the directors of the Drury Lane Theatre were equally as anxious as the London County Council to have their theatre in a perfectly satisfactory condition. For his own satisfaction he took a note of the time it took to clear the audience out of the auditorium recently, and he found it was 1¾ minutes, whilst the fire-curtain was lowered in ten seconds. The public were also entitled to know that for twenty years past the theatre had been in telephonic communication with the Holborn fire station.

Colonel Rotton disagreed with the idea of an arbitration, and considered it would be fatal to the confidence which the people of London had in the Council.

Mr. Howell Williams also deprecated the Council allowing an arbitrator to come between the Committee and their work.

Mr. Burns, M.P., said they wanted the Drury Lane directors to defer to recognised authority and carry out precautions based on the experience and scientific knowledge of the architect and the Chief of the Fire Brigade. Unless that was done the public would have no confidence in Drury Lane. He thought Parliamentary powers should be obtained to place the theatre on the same footing as other theatres.

The report was then agreed to.

Theatre Fire Lessons.—Mr. E. Smith, Chairman of the Fire Brigade Committee, asked the Chairman of the Committee the following questions:—(1) Will you see that no temporary erections or obstructions are allowed in any passages or paths, but that free egress and ingress must be given, and that no standing or sitting is allowed on intersecting gangways? (2) Will you see that a notice is painted on all emergency and other exits, giving directions as to the use of such exits? (3) What steps the Committee propose to take in connexion with churches, chapels, and halls, not licensed, but in which meetings and exhibitions and lectures are given? (4) What provisions are made to secure safety to people attending bazaars, public halls, and other places temporarily licensed?

Dr. Fletcher Little asked the Chairman whether he possessed any means of dealing with churches and chapels which were often dangerously overcrowded.

Sir Algernon West, Chairman of the Committee, said that frequent examinations of inspection were made of all theatres and music halls, and where necessary and possible the Council's requirements were enforced. Notice was painted on all emergency doors and exits. Churches and chapels did not come under the purview of the Theatres Committee; that was a matter for the Building Act Committee, and it was a very serious point. As to temporary licences, they were only granted by the Council for the purpose of stage plays, and in such cases the premises were always inspected by the Council's officers, who advised what should be done to secure the safety of the audience. As to the fatal fire at Chicago, he said that although no official report had yet been received, the danger seemed to have arisen from the theatre being opened without the proper authority having been given as to its fitness. That could not possibly occur in this country. The Theatres Committee of the London County Council never allowed a theatre to be opened until it was satisfied as to the place's safety by thorough examination by the architect and other officials. The exits which existed in Chicago would never be permitted in London, for some of those exits opened on to balconies from which there were no exits. The fire curtain was of asbestos, of a very friable character, and quite unfit for the purpose for which it was required. In London theatres the fire curtains were made of riveted steel, and in addition to that, in all new theatres there were skylights with automatic openings to draw the smoke up. The site regulations in London provided for half of the boundaries of theatres being open thoroughfares, one of which should be 40 ft. and the other not less than 20 ft. wide. The floors and tiers were now made fire-resisting, the number of exits were increased, as well as the gangways, and were provided for those behind as well as for those in front of the stage. In these days of greatly increasing knowledge in mechanical appliances there could be no finality, and at the Alhambra the Theatres Committee, in conjunction with the Lord Chamberlain, had recently witnessed gauzes, cotton-wool, silk, and scenery subjected to the fiercest flames and coming out of the ordeal without a blemish. Since then the Committee had issued a circular to all theatres asking them to have their scenery, etc., treated by the same fireproofing process, which was cheap and safe. He was glad to say that the replies which were being received from the lessees were entirely satisfactory. They must also insist upon telephonic communication being established between the theatres and the nearest fire station, and he thought they should also insist upon all exits being thrown open at the conclusion of every performance. When he mentioned that 400,000 people nightly visited places of amusement in London it would be realised how great was the task cast upon the Committee in seeing that proper regulations were laid down for public safety. The Council and the managers were undoubtedly responsible for seeing that those regulations were given effect to, but in regard to panic the British public were alone responsible. He believed, however, that as the public got to know with what care the regulations were carried out the less would be the fear or possibility of panic.

Central School of Arts and Crafts and London Day Training College.—The Technical Education Board reported that on May 21, 1901, the Council appropriated, under the provisions of the Technical Instruction Acts, for the purpose of the Central School of Arts and Crafts, a site having frontages in Southampton-row and Orange-street at the junction of Orange-street and Theobald's-road, the estimated value, viz., 45,000*l.*, to be refunded to the Council by the Technical Education Board by annual payments extending over sixty years. On July 21, 1903, the Council resolved to retain the site occupying the remaining frontage in Southampton-row up to the corner of the extension of Fisher-street, and appropriated if for the purposes of technical education within the provisions of the Technical Instruction Acts for the London Day Training College, the estimated value, viz., 30,200*l.*, being refunded to the Council by the Technical Education Board by annual payments extending over sixty years. Sketch plans and elevations for the two buildings—viz., the Central School of Arts and Crafts and the London Day Training College—have been prepared by the superintending architect. The architect's approximate estimate of the cost of the buildings, including the expenditure upon the plans, quantities, clerk of the works, and all other incidentals, is under 120,000*l.* The Committee further stated that:—

"In the ordinary course working drawings and specifications would have been prepared, quantities taken out, and an accurate estimate of the cost made by the Council's quantity surveyors before bringing the question of the buildings again before the Council, the cost of the same being defrayed out of the moneys entrusted to us by the council; but, as the cost of preparing the working drawings for so large a building and of taking out and lithographing the quantities is a considerable item, we have thought it desirable to secure the Council's approval of the architect's sketch plans, and in particular of the character of the elevation, before incurring further expense. If the Council approve the sketches submitted it is expected that the working drawings, specification, and quantities will have been completed and that the Board will be in a position to commence building operations in September, and the buildings will be completed and ready for occupation at the beginning of the school year 1906-7. In order to meet the requirements of the superintending architect with regard to the façade in Southampton Row, we proposed that the front shall consist entirely of Portland stone except to the height of the first floor, where a granite facing will be employed. We also desire to point out that by erecting the two buildings side by side and by providing means of communication between them on at least two floors considerable economy will be effected in connexion with working expenses, and more particularly as the Training College will be mainly utilised during the daytime, and the Central School of Arts and Crafts in the evening. It will thus be possible to make one lecture theatre serve the purpose of both institutions, to employ one caretaker, to provide one refreshment department and one system of heating and lighting, and to allow a certain amount of circulation between the two schools so as to permit of the common use of art studios, laboratories, and examination halls. . . We therefore recommend—That the architect's sketch plans for the erection of the Central School of Arts and Crafts and the London Day Training College on the site in Southampton row appropriated by the Council for the purpose be approved."

The recommendation was agreed to.

District Surveyor for Hammersmith.—The Building Act Committee reported that Mr. T. E. Knightly has resigned as from June 30, 1904, his appointment as District Surveyor for the district of Hammersmith.

Housing.—The Housing of the Working Classes Committee recommended, and it was agreed, that, subject to the necessary consents under the London Building Acts being subsequently obtained, the plans submitted by the Council of the Metropolitan Borough of St. Pancras, of a block of dwellings proposed to be erected on the Brantome-place area in pursuance of the St. Pancras (Brantome-place and Prospect-terrace) Order, 1901, under Part II. of the Housing of the Working Classes Act, 1890, be approved.

Port of London.—It was recommended by the Parliamentary Committee that approval be given to their opposition to the London Port and Docks Bill and the London and India Docks Company Bill.

Mr. Sidney Low hoped the Committee would not be unbending in their opposition to the Bill of the Government, although some amendments in that Bill would be necessary. The whole trade and commerce of London were dependent on the proper management of the Port of London, and if the Council did not support the Bill nothing whatever would be done.

Mr. McKinnon Wood believed the Council appreciated the importance of the matter, and was anxious to have the Docks and Port placed under the control of a public authority.

The recommendations were adopted.

Electric Tramways in North London.—On the reception of the Highways Committee Report, which dealt at some length with the difficulties of electrifying the tramways on the north side of the Thames, Mr. Beachcroft said that the underlying idea of the report appeared to be to throw the blame for delay on the North Metropolitan Tramways Company, but, as a matter of fact, under the lease the Council could come in at any time and electrify the lines.

Mr. Benn said the company was entitled to quiet enjoyment, and it was almost impossible to carry out the work unless they co-operated. At present, if they attempted to lay down the conduit system, it would be in the face of the company.

The Council adjourned at half-past six.

Additions to Baptist Chapel, Combe Martin, Devon.—Memorial-stones of a new vestry and class-rooms in connexion with the Baptist Chapel, Combe Martin, were recently laid. The building has been erected from the designs of Mr. F. Creek, architect, by Messrs. Baker and Darch, builders.

APPLICATIONS UNDER THE 1894 BUILDING ACT.

THE London County Council at their meeting on Tuesday dealt with the following applications under the London Building Act, 1894. The names of applicants are given between parenthesis :—

Lines of Frontage and Projections.

Dulwich.—A building upon a site abutting upon the south side of East Dulwich-road, east side of Oakhurst-grove, and north side of Solway-road, Dulwich (Mr. A. Keen for Mr. H. Line).—Consent.

Islington, West.—A projecting wooden sign in front of Nos. 36, 38, and 40, York-road, Islington (Mr. S. Jones for Messrs. W. B. Fordham and Sons, Ltd.).—Refused.

City.—A stone hood over the entrance to No. 1, Old Broad-street, City, and projecting over the public way (Mr. H. C. Clarke for the Indemnity Mutual Marine Assurance Company, Ltd.).—Refused.

Lines of Frontage and Width of Way.

Hammersmith.—A three-story building, and three one-story shops at Nos. 331, 333, and 335, King-street, Hammersmith (Mr. G. Trotman for Dr. E. Cullinan).—Consent.

Width of Way, Line of Frontage, and Construction.

Southwark, West.—A luffing crane and platform on the north side of Bankside and of a gangway across that street to connect such structures with No. 6, Bankside (Mr. W. J. Perkins for Messrs. Harrison and Crosfield).—Consent.

Formation of Streets.

Lewisham.—That an order be issued to Mr. J. W. Webb sanctioning the formation or laying out of new streets for carriage traffic to lead out of the east side of Bexhill-road to Ravensbourne-park, and also new streets for carriage traffic to lead from Codrington-hill to Stillness-road, Lewisham.—Agreed.

Space at Rear.

Holborn.—A modification of the provisions of section 41 with regard to open spaces about buildings, so far as relates to the proposed erection of an addition to Taverner's Temperance Hotel, Hunter-street, Holborn, to abut upon Compton-street (Mr. R. H. Hill for Mrs. A. Taverner).—Consent.

Hampstead.—A modification of the provisions of section 41 with regard to open spaces about buildings, so far as relates to the proposed erection of a van and roller house and workshops at the Hampstead Borough Council's store yard and depôt, Lymington-road, Hampstead (Mr. O. E. Winter).—Consent.

Chelsea.—A modification of the provisions of section 41 with regard to open spaces about buildings, so far as relates to the proposed erection of buildings on a site abutting upon the north-west side of Basil-street and east side of New-street, Chelsea, with open spaces about such buildings (Mr. R. Bennett).—Refused.

Means of Escape at Top of High Buildings.

Hoxton.—Means of escape in case of fire proposed to be provided in pursuance of section 63 of the Act, from the topmost stories of Nos. 2 to 12, Wilson-street, and Nos. 2 and 3, Eldon-street, Finsbury (Mr. G. Sherrin for Mrs. A. Sadgrove).—Refused.

Buildings for Supply of Electricity.

Westminster.—Permission to retain for a further period the temporary iron chimney shaft at the electricity generating station, Millbank-street, Westminster (Mr. C. S. Peach).—Consent.

Dwelling-houses on Low-lying Land.

Camberwell.—Two cottages with stables at rear on low-lying land, situated between Wyndham-road and Beckett-street, Camberwell (Mr. H. W. Rising for Mr. R. Pettifor).—Consent.

SHADWELL MARKET AREA.—The Billingsgate and Leadenhall Markets Committee of the Corporation have framed a scheme for widening High-street, Shadwell, from an average of about 26 ft. to 50 ft., and erecting working-class dwellings, with shops on the ground floors, and for the closing, or partial closing, of several small streets which intersect the sites now vacant or occupied by dilapidated tenements in the main thoroughfare, the necessary paving works to be undertaken by the Stepney Borough Council, and the shops and dwellings to be built as a private venture. Their concurrent project relates to the development of the Corporation's market at Shadwell primarily for sale of fish, and as a supplement to the market at Billingsgate. The market, upon which 140,000*l.* has already been expended, was acquired under an Act of Parliament by the Corporation nearly two years ago.

THE ARCHITECTURAL ASSOCIATION DISCUSSION SECTION:

THE VENTILATION OF CHEMICAL LABORATORIES.

THE seventh meeting of the Association Discussion Section for the present session was held on January 27, when Mr. T. H. Russell, M.A., read a paper on the "Ventilation of Chemical Laboratories," illustrated by diagrams, models, and demonstrations, which added greatly to its value.

Mr. Russell, after remarking that it would be unnecessary that he should dwell upon the great need of efficient ventilation in all chemical laboratories, dealt with the subject naturally under two heads, namely (1) general ventilation, or the process of replacing air rendered impure by respiration and combustion with fresh air; and (2) local or special ventilation for removing all fumes and noxious vapours emanating from chemical processes which, if allowed to diffuse into the room, would quickly vitiate the atmosphere. In natural ventilation, in which the movements of the air within a building are chiefly due to the difference in weight of equal volumes of air, too much importance was usually given to the aspiratory power of the wind passing over the roof, and that for chemical laboratories a stronger, more certain, and regular system is required than natural means can supply. The various methods of providing artificial ventilation were then dealt with. Ventilating radiators were an excellent means of supplying a current of warm fresh air into a room, but they had the disadvantage of being liable to become useless and their action reversed by the aspiratory power of the wind outside. Open fireplaces, although insuring the extraction of a certain amount of air from an ordinary room, were not satisfactory for a chemical laboratory on account of the constant attention required, and the dirt they give rise to where coal is the fuel; while gas fires are extravagant and the fumes may be troublesome. In many chemical laboratories the ventilation is effected by the simple and inexpensive method of heating the ventilating flues either by the introduction of a gas burner or by utilising the heat from furnaces or other sources to abstract the impure air. The former method is advantageous on account of the small space occupied by the apparatus required when used for the special ventilation of draught closets, etc., while the "plenum" system of ventilation possesses the important advantage of increasing the efficiency of the local ventilation by insuring that the internal pressure is always slightly in excess of that of the external atmosphere.

In dealing with the second head, of local or special ventilation, Mr. Russell said that he thought the most efficacious method was the employment of enclosed centrifrugal fans—either aspiratory or respiratory, but that precautions must be taken to preserve the fan from the corrosive effect of the fumes, either by constructing it of some material which will not be affected—such as tinned copper—or by protecting it with special paint. Care must also be taken to see that the fan is powerful enough for the work, that the ducts are correctly proportioned in cross section, the main pipe duly increased after each junction with a branch pipe, and the internal friction of the flues reduced as much as possible.

The principal appliances for special ventilation were described: draught closets and hoods over combustion benches; draught hoods or small closets at intervals on the benches, intended to immediately carry away the fumes; and it was pointed out how draught closets should, where possible, be placed against the walls in order to facilitate the planning of the extract flues directly and inconspicuously; in all cases the flues required to be planned and executed with care in order to insure an equal draught at every point. With a central system of ventilation where each draught closet has a separate flue the danger of some of the flues acting as inlets must be guarded against. Among the draught closets described was one invented by Professor Woodbridge, of Boston, the main principle of which consists in the introduction of a baffling board in the closet, fixed at the top, but sloped up from back to front, leaving at the front a long narrow vent slot.

The paper was concluded by a reference to the necessity of providing local as well as general ventilation in the lecture room, as apart from the laboratory, for the use of the lecturer, and to the advisability of placing a large draught closet accessible from both the lecture room and the preparation room when practicable, and to the two or more down-draught flues fitted into the lecturer's table for his use.

Mr. A. E. Munby, in opening the discussion, after referring to the useful book on laboratory fittings which Mr. Russell had recently written, agreed that many important laboratories were very badly ventilated, and in speaking of fans, mentioned that the "Sirocco" fan had been brought to his notice, and was undoubtedly remarkably efficient. He pointed to the use which might be made of the furnace of a hot-water system in the way of assisting the ventilation scheme, and gave some interesting data which he had worked out in this connexion, observing that makers of heating stoves might well pay attention to the design of airtight ones. Such furnaces, he estimated, would suck in air at a velocity of about 3 ft. per second, which gave a basis for calculating the size of the ducts. He also gave some formulæ—worked out for him by a mathematician—dealing with the allowances to be made in exhaust power in overcoming inertia, passing bends, and loss by friction in air ducts.

Mr. Kenneth Gray, who had come as a visitor, thought that it was remarkable that in England, where a great deal of attention had been given to the sanitary question, there was no educational centre where the science of heating and ventilating was taught as a special subject, whereas, in America, and in nearly all the countries of Europe, it was considered an important part of the civil engineer's training, and was taught at the Universities. It was due to this that so much difference of opinion existed here as to the best means of heating and ventilating; for, having very little definite knowledge, individual speculation was apt to take the place of more definite principles. With regard to the position of outlets, it was generally considered that exhaled air rose immediately to the ceiling; this was open to doubt. A close investigation of the facts seemed to show that as long as the aspired air remained at the higher temperature it would tend to rise, but on cooling it would fall; therefore in extracting near the floor level a very complete change of the air was secured. As to ventilating radiators, a rather remarkable fact was that greater efficiency was attained when the air inlet was open and with cold air passing in through the radiator than when the inlets were closed against the cold air. There were several very efficient fans in the market; but, as a rule, a fan that worked silently could not be doing much work, the silence being generally obtained at the expense of velocity, and the greater the velocity the higher the efficiency. With the "plenum" system—which was unfortunately expensive—temperatures could be regulated with great accuracy; moreover, cool air could be supplied in hot weather by being passed through sprays of cold water or over ice.

Mr. F. Lishman said that, unfortunately, it was not always found possible to put the theories which had been advanced as to ducts, etc., into practice, but it was, nevertheless, necessary that they should have the theories to aim at. If everything that appertained to the ventilating and fitting-up of laboratories could be standardised, it would be a good day for the architects concerned, who too often found that what was good from one professor's point of view was, as likely as not, to be condemned by a new professor, with different ideas, coming on the scene. The "general" ventilation seemed to him to be of much greater importance than the local or special ventilation, for, however perfect the latter might be in detail, the carelessness of even students of chemistry was not altogether an absent quantity, and often rendered the most elaborate arrangement of hoods or draught closets more or less useless. He thought the draught closet designed by Professor Woodbridge an excellent arrangement in section, but unless it had lateral divisions—which, he understood, it was not intended to have—the fumes, it would seem, could not be kept under control.

Mr. L. Ambler regretted that there were not more present, as they would have found the paper both interesting and instructive. In experience he had found ridge ventilators efficient where used in a comparatively high roof, but not where the ceiling was lower, where they had a tendency to act as inlets. He supposed that the reference made to barristers at the Law Courts not being able to retain their wigs on account of the draughts did not include those who had "special retainers." The humming of the fans was objectionable, especially to rather deaf people, curiously

enough. He had noticed a feeling of oppression when in hospital wards ventilated on the "plenum" system. It was curious that, in the past, the term "ventilator" was applied to a "man," whereas it was now a "hole in a wall," while in Shakespeare's "Midsummer Night's Dream," the hole in the wall was represented by one of the actors.

After Messrs. M. G. Pechell, A. S. Taylor, and C. Pickford had spoken, Mr. H. Gregory Collins, the Chairman, called upon Mr. Max Clarke, the Special Visitor, who had come down at some personal inconvenience. Mr. Clarke remarked that the important subject of ventilation was still in its infancy, and that unanimity might be attained in time. The standardising of fittings might, he thought, also come; at present there were particular people with particular articles The Hoff Theatre, Vienna, was an instance of the perfect working of the "plenum" system where the temperatures of the various rooms were suitably regulated. The Metropolitan Opera House New York, had the hot air let in before the audience arrived; the walls thus became heated, the fresh air was then let in, and it was found to work admirably. As regards ducts he thought that, after the theoretical size had been obtained, at least a third or a quarter ought to be added in order to insure efficient working.

ARCHITECTURAL SOCIETIES.

Leeds and Yorkshire Architectural Society.—At a meeting of this Society, held on the 28th ult., the President (Mr. Butler Wilson) in the chair, a paper entitled "The Homes of Queen Elizabeth" was read by Mr. J. Alfred Gotch, F.S.A. Mr. Gotch referred to the fact that for some years prior to Elizabeth's reign it had been growing less incumbent that houses should be rendered secure against attack. This, together with a widespread desire for greater comfort, led to many new houses being erected and old ones remodelled. The ramifications of the renaissance of classic art reached this country, and although English tradition was predisposed to Gothic forms, the classic fashion resulted in a piquant mingling of the two styles which distinguishes most Elizabethan mansions. Numerous lantern views, illustrative of the plans, exterior and interior decorative treatment of famous examples, were exhibited. A vote of thanks was extended to the lecturer on the motion of Mr. Robert P. Oglesby, seconded by Mr. G. B. Bulmer.

Sheffield Society of Architects.—In connection with the Sheffield Society of Architects and Surveyors, a meeting was held in the Society's rooms in Leopold-street on the 28th ult. Mr. T. Winder (President) occupied the chair, and the greater portion of the evening was devoted to a lecture given by Mr. C. M. Hadfield, entitled, "Notes on the Study of Architectural Design." In the course of his remarks, Mr. Hadfield advised all students to cultivate the faculty of accurate observation, and to avoid being partial to any particular manner or style. They should, on the contrary, obtain the best in all. He described the various ways of studying, and emphasised the necessity for trying to find out the motives which prompted the designer of a building in producing it. Concluding, he reviewed the main characteristics by which sound architecture was distinguished. A vote of thanks was accorded Mr. Hadfield, on the motion of Mr. T. M. Jenkinson, seconded by Mr. H. G. Warlow, and supported by Messrs. H. L. Paterson, J. B. Mitchell-Withers, C. B. Flockton, and others.

Edinburgh Architectural Association.—A meeting of the Edinburgh Architectural Association was held on the 27th ult. in the Association rooms, 117, George-street, Mr. J. A. Arnott (chairman of the Associates' Section) presiding, when a paper was read by Mr. J. Maurice Arthur, delegate from Glasgow Architectural Association, on "Some Interesting and Necessary Legal Points in Building." In the course of his paper he referred to the duties and responsibilities of an architect as arbiter and agent, and as dealing with certificates, plans, fees, and contracts. He also dealt with the laws relating to buildings, including mutual gables, flats, tenements, servitudes and ground restrictions.

Liverpool Architectural Society.—The sixth ordinary meeting of the session of this Society was held on the 1st inst., at the rooms, Harrington-street. Mr. T. E. Eccles, vice-President, presided. A paper was read by Mr. Herbert Tanner, jun., of London, on "Interior Woodwork in England." He dealt chiefly with domestic woodwork of the Renaissance period, and showed the influence of Italian and other craftsmen in developing the treatment of woodwork, and traced the various steps which marked the progress of that branch of domestic architecture. Various examples were given of panels, doors, staircases, and hall screens as illustrated in many old halls and mansions throughout the country. A number of drawings, which were exhibited, served to illustrate the various points of the lecture.

ENGINEERING SOCIETIES.

The Institution of Civil Engineers.—At the ordinary meeting, on the 2nd inst., Sir William H. White, K.C.B., President, in the chair, it was announced that nine Associate members had been transferred to the class of members, *viz.*, Messrs T. Aitken, W. B. Basset, S. G. Brounger, H. H. L. Brown, W. F. Butler, W. F. Fletcher, P. T. Gask, A. P. Gray, and A. Hoare. It was also reported that five candidates had been admitted as students, *viz.*, C. L. Fortescue, B.A., A. F. Harrison, B.Sc., G. W. Hilditch, J. B. Young, B.Sc., T. A. Young. The monthly ballot resulted in the election of one Honorary member, *viz.*, The Right Hon. Viscount Kitchener of Khartoum, Commander-in-Chief of H. M. Forces in India. Seven members, *viz.*, Major Sir Robert Hanbury Brown, K.C.M.G., C. A. Hasbrouck, F. T. Marshall, A. J. Pringle, W. Rich, P. C. Ricketts, J. J. Welch. Fifteen Associate members, *viz.*, R. D. T. Alexander, Stud. Inst. C.E., J. E. Barbier, F. G. Brighton, Stud. Inst. C.E., A. W. Burford, C. L. Cartwright, E. Falk, Stud. Inst. C.E., J. Holliday, E. C. Jansen, Stud. Inst. C.E., E. W. Kitchin, Stud. Inst. C.E., R. S. Lea, H. F. Peet, R. U. Shaxby, B.A., Stud. Inst. C.E., J. R. Taylor, B.A., Stud. Inst. C.E., W. Waters, Stud Inst. C.E., C. Weekley, B.A.

Illustrations.

DESIGN FOR A CHURCH.

This was a competition design, not carried out, but which we are glad to publish as a fine design and drawing, executed by the architect, Mr. E. B. Lamb. It is not every architect who can produce so effective a perspective drawing of his own design.

NEW CATHOLIC CHURCH, NORWICH.

This church is being built by the Duke of Norfolk on a very fine site raised well above the town. When completed, with its lofty central tower, it will be a conspicuous object through the surrounding neighbourhood.

The nave, which is ten bays in length, was built by Mr. George Gilbert Scott, and the church is being carried on by his brother, Mr. J. O. Scott. The eastern part is making good progress and the triforium stage has been reached. The style of the choir is somewhat later than that of the nave, and it is treated rather more richly.

The view published (which was exhibited at the Royal Academy last year) shows the north transept with its apsidal chapel. The work is being carried on without a contractor, Mr. Burton, the able clerk of the works, having full charge. It is expected that the church will be finished in about four years.

J. Oldrid Scott.

STUDIOS, BOLTON GARDENS SOUTH.

These buildings, which are now in course of erection, have been designed with a view to combining a small bachelor's house with servants' accommodation and a large studio.

The walls are coated with Portland cement rough cast, and the roofs are grey-green slates.

The builder is Mr. Minter, and the architect Mr. Walter Cave. The drawing was exhibited at last year's Royal Academy.

VILLA, SANDIACRE, DERBYSHIRE.

This is a pretty sketch of a small country house by Mr. J. R. Poysser. The name of the place should, we believe, be "Sandiacre," not "Sandiacoe," as on the title of the plate.

DESIGN FOR A HOUSE FRONT IN STONE AND BRONZE.

A good deal has been said recently as to the employment of metal in combination with the building materials commonly used in architecture; and the design by Mr. Smith, a drawing which was formerly exhibited at the Royal Academy, is an interesting experiment in this direction. The author writes in regard to it:—

"The purpose of this design was, as far as possible, to illustrate the use of metal applied to the surface of a wall in conjunction with stone, and to make heraldic design the basis of the scheme of ornamentation.

"By adopting family coats-of-arms and crests a certain amount of individuality could be given to the house. As will be seen from the illustration, an elaborate frieze gives scope for the covering of a large surface of ornament, and protection for this is obtained by giving great projection to the cornice. In order to emphasise the special nature of the ornament, little or no carved stone work is used, and all mouldings and other details are treated as broadly as possible. The windows, of course, can be treated with stained glass, the same scheme of decoration being followed throughout."

Correspondence.

BUILDING RULES FOR SCHOOLS.

Sir,—It is a matter of common knowledge to the Architectural profession that the building rules in respect of public elementary schools published during the last twenty years by the Board of Education (and its predecessors in title) were framed by me and revised year by year.

I find some new rules have recently been issued by the same body for the planning and equipment of secondary schools, and I had been about to disclaim any credit in respect thereof.

On examining them more particularly, I find that, except so far as founded on mine for public elementary schools, they are wrong in many particulars and ignorant or lacking in judgment as to others.

I beg, therefore, to record the fact that I have not been consulted about them, and should be very sorry to accept responsibility for any trouble they may cause to architects.

Edward Robert Robson.

THE GARDEN CITY.

Sir,—In your issue of January 23 you refer to this enterprise, and say that, much as you wish success to the scheme, you have grave doubts as to its success.

As I have always taken a very great interest in this movement, and believe it to be the only sound method of solving the increasing congestion in large towns, I shall be much obliged if you will allow me to point out some of the advantages from a business point of view.

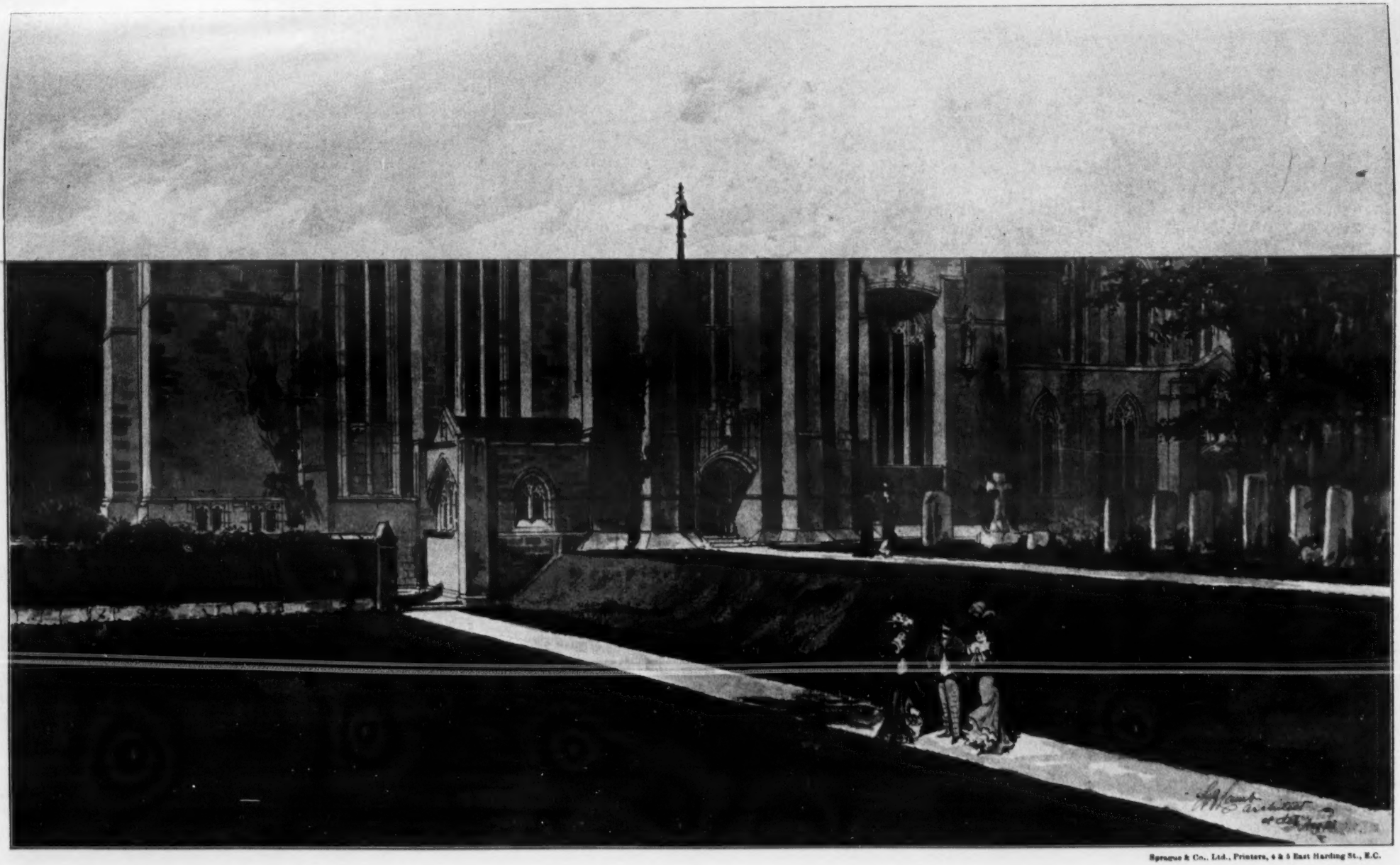
Private landowners like the Duke of Devonshire in Eastbourne have already proved what a great advantage it is to have a town developed under strict rules as to open spaces, etc. Any manufacturer who moves to the Garden City will have the following great advantages:—

(1). He will have a cheap site for his factory, free from any restrictions as to light and air, or heavy premiums to ground landlords. This will enable him to construct his factory on the most approved lines, without being obliged to carefully consider every extra foot of ground he may cover. He will thus obtain infinitely better accommodation at a very much lower rent.

(2). His factory being built on the best lines, his work people will follow their occupation under very improved conditions, instead of being crowded together to the utmost extent that the Factory Act will allow; and they will be able to do their work in much healthier surroundings, and with greatly improved light and air.

(3). The work people employed in the factory will also be able to obtain cottage homes, with a garden, at a reasonable rent, which is a very much healthier form of living than being crowded together in rooms, built one on the top of another, in a crowded London slum. This will not only improve the health of the people and that of their children, but will also, no doubt, improve the quality of their work.

(4). The surrounding agricultural population will benefit by having a market for their produce brought into their midst, and there will be increased employment for agricultural labourers at better wages. At present, farm produce has such heavy tolls to pay in railway



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PROPOSED CHURCH.—Designed and Drawn by Mr. E. B. Lamb.

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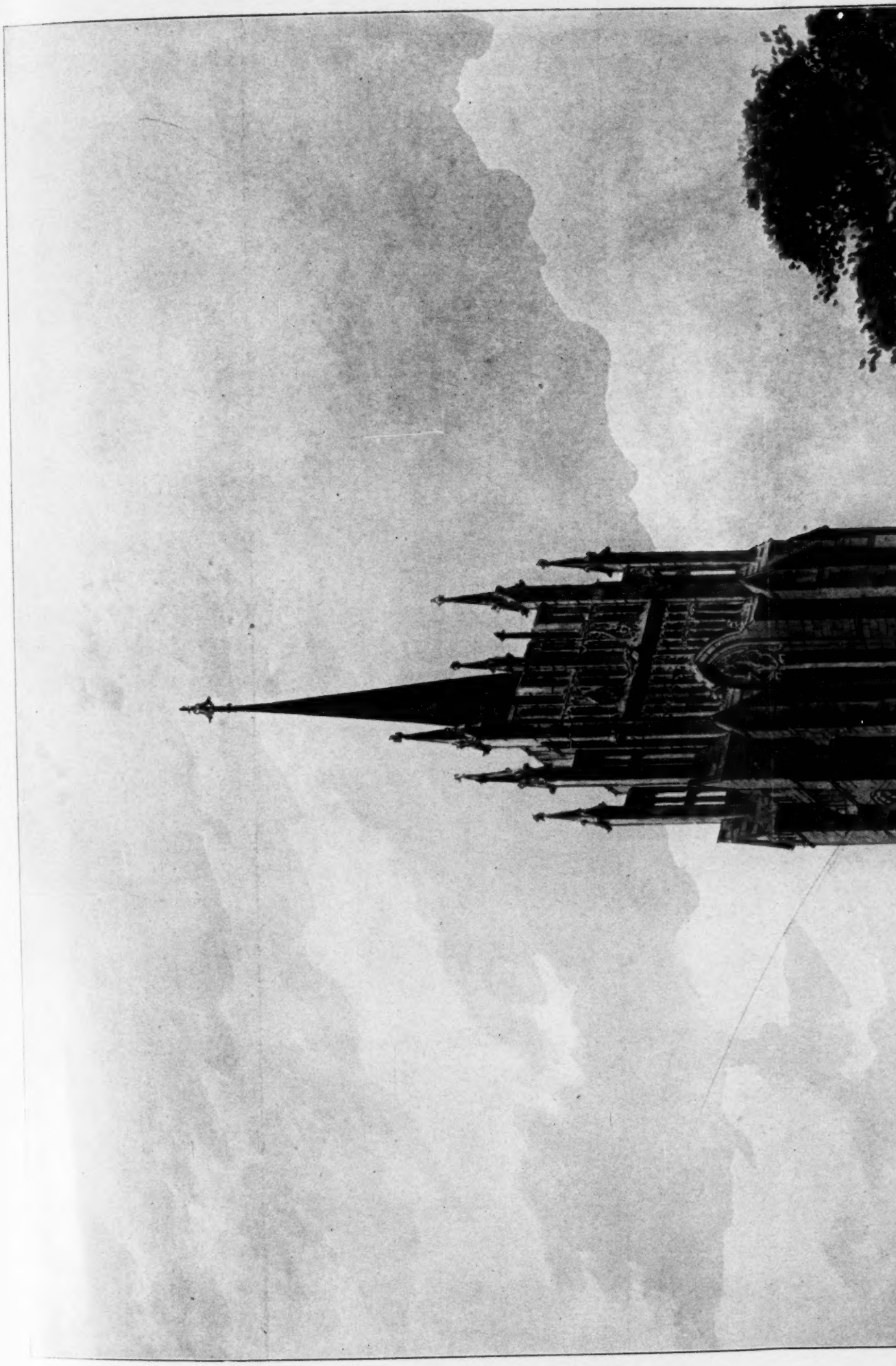

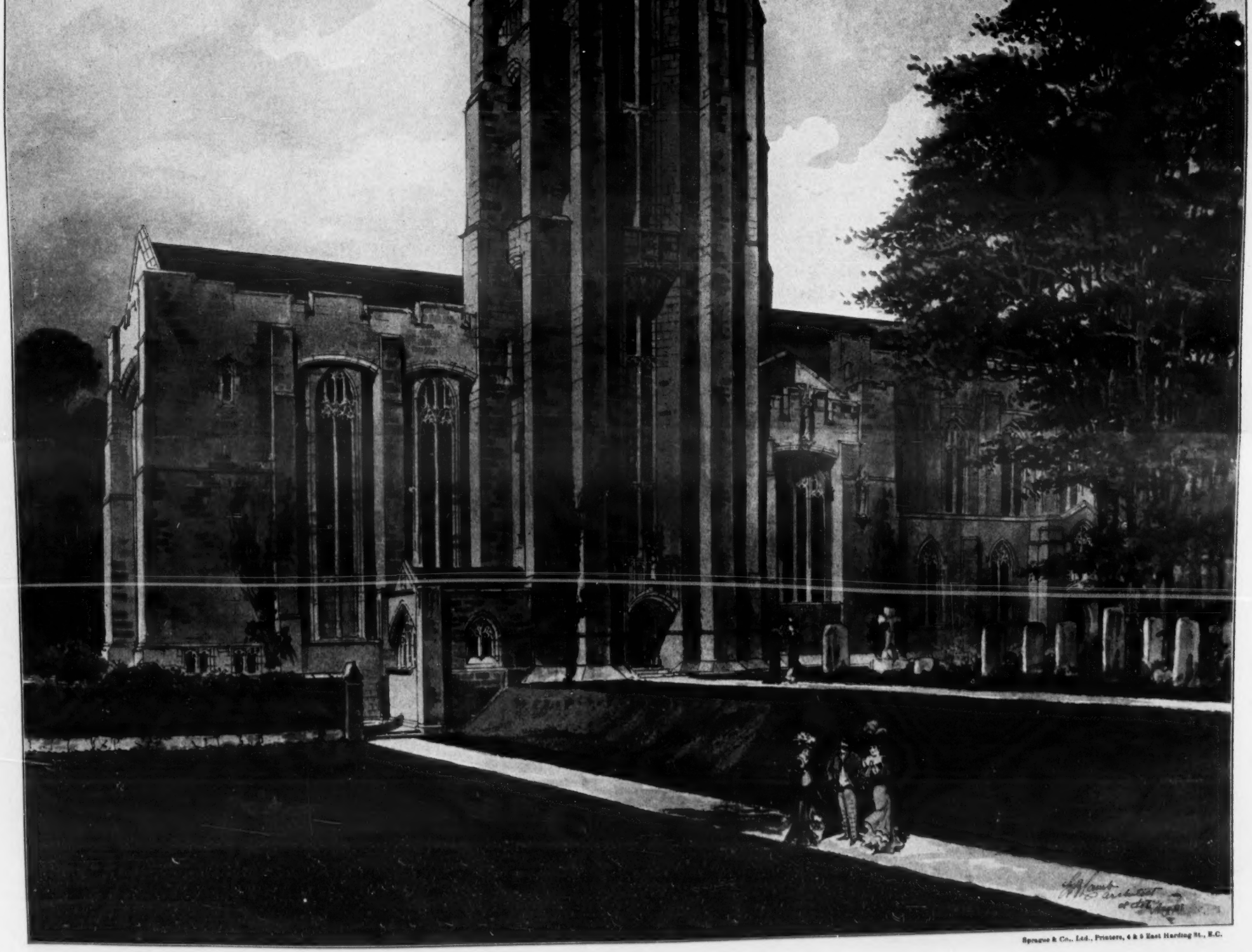

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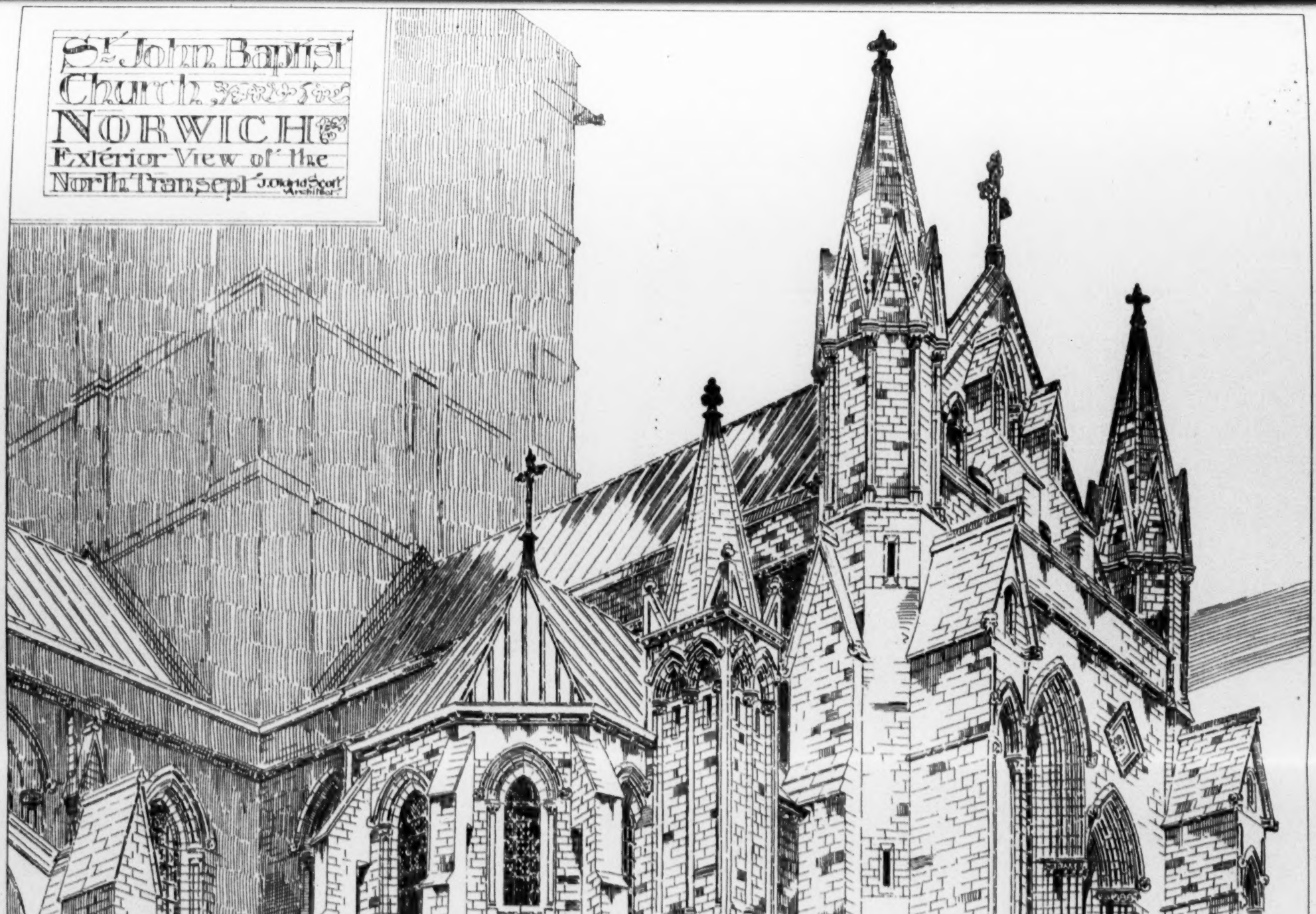
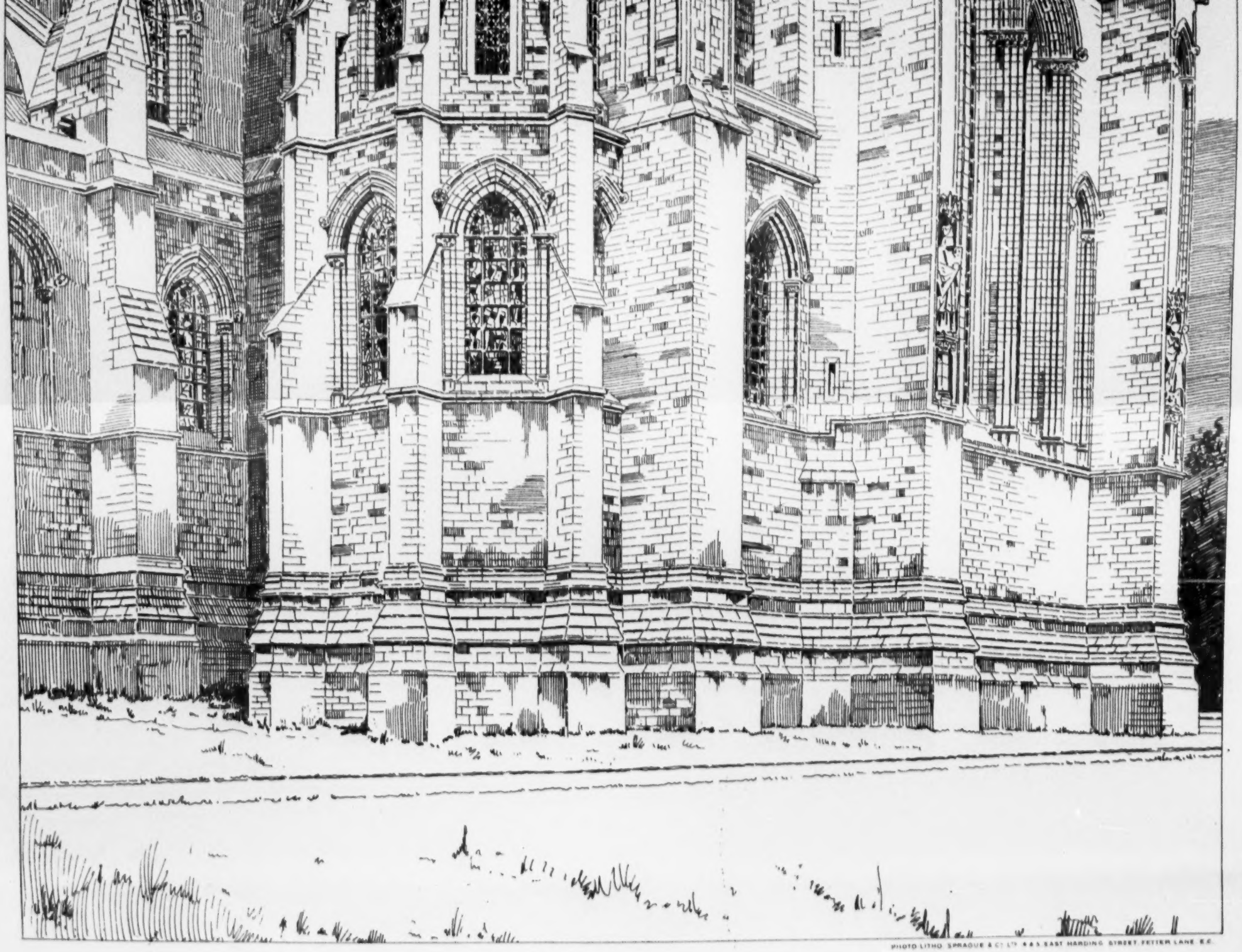
PROPOSED CHURCH.—Designed and Drawn by Mr. E. B. Lamb.

St John Baptist
Church
NORWICH
Exterior View of the
North Transept



G. Gilbert Scott
Architect



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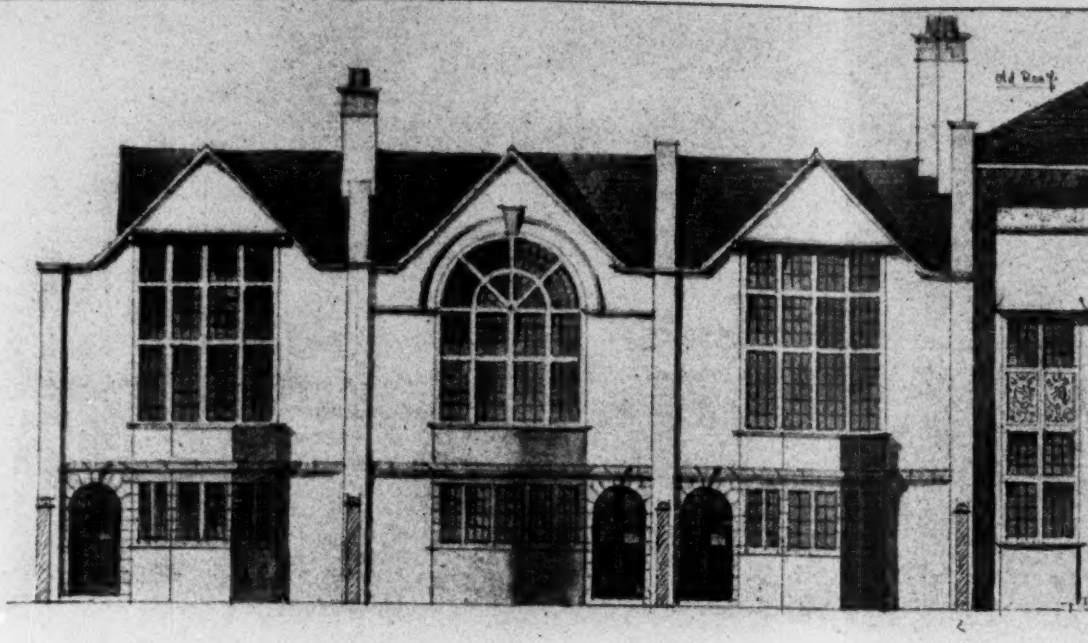

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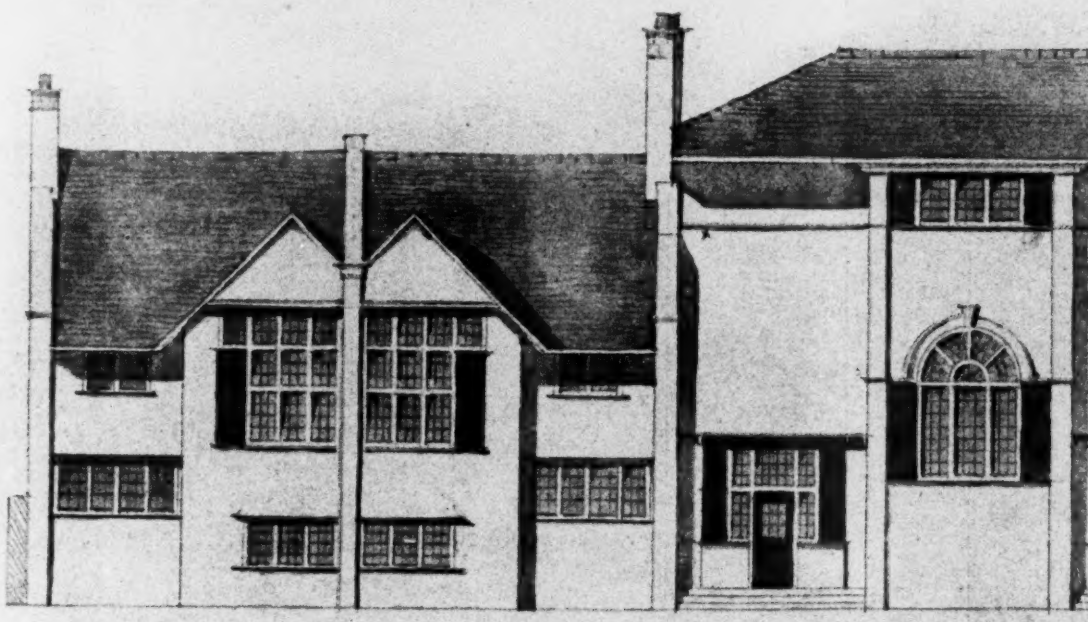

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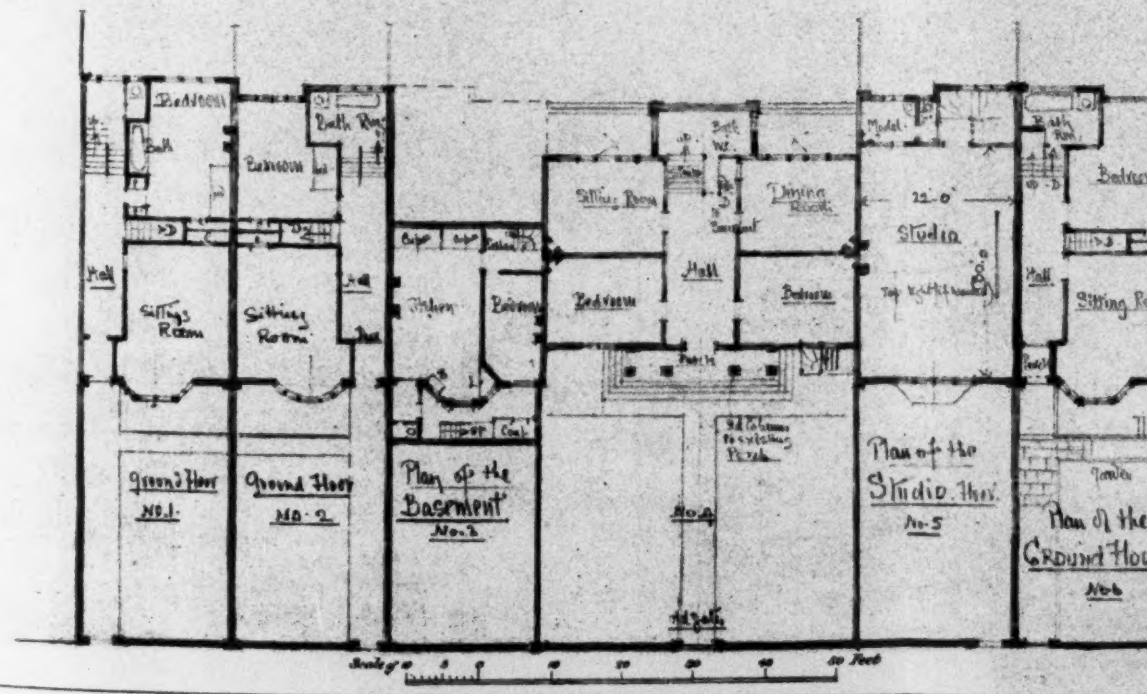

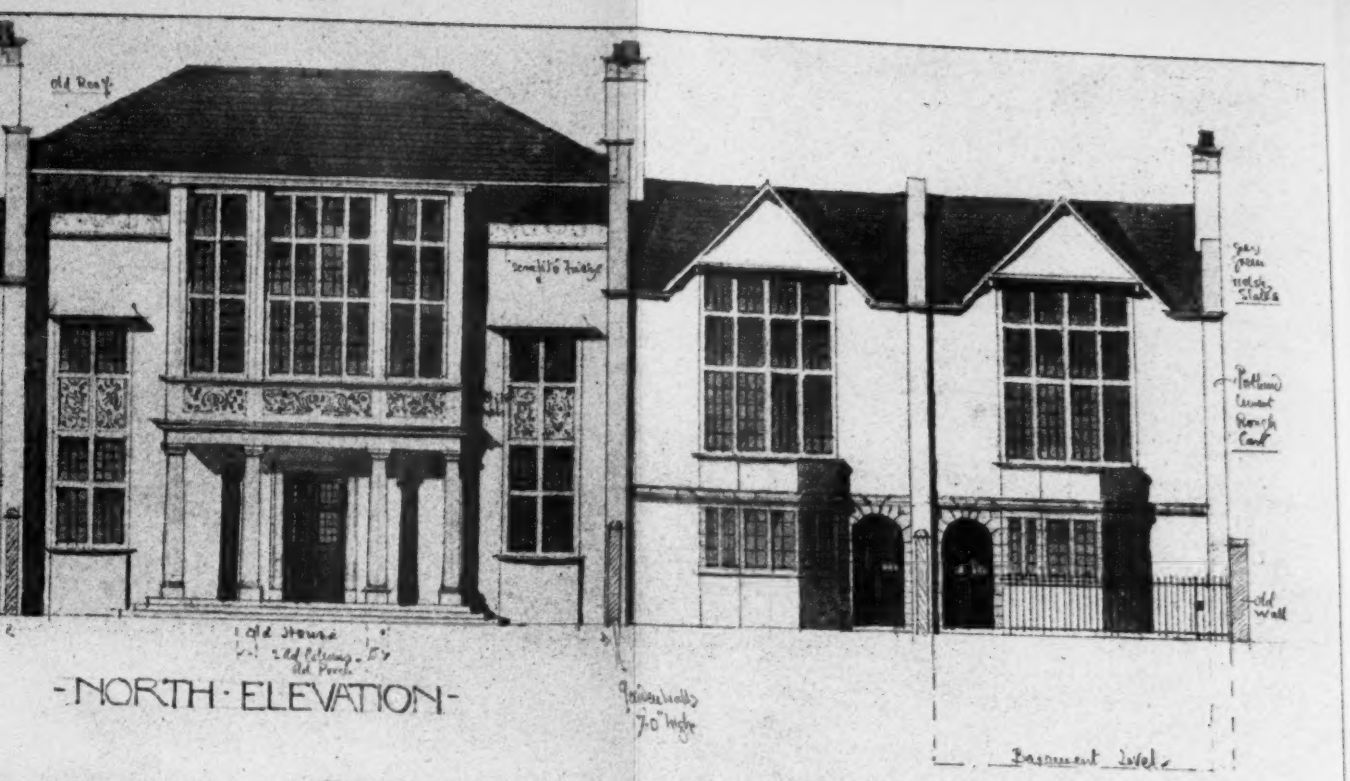

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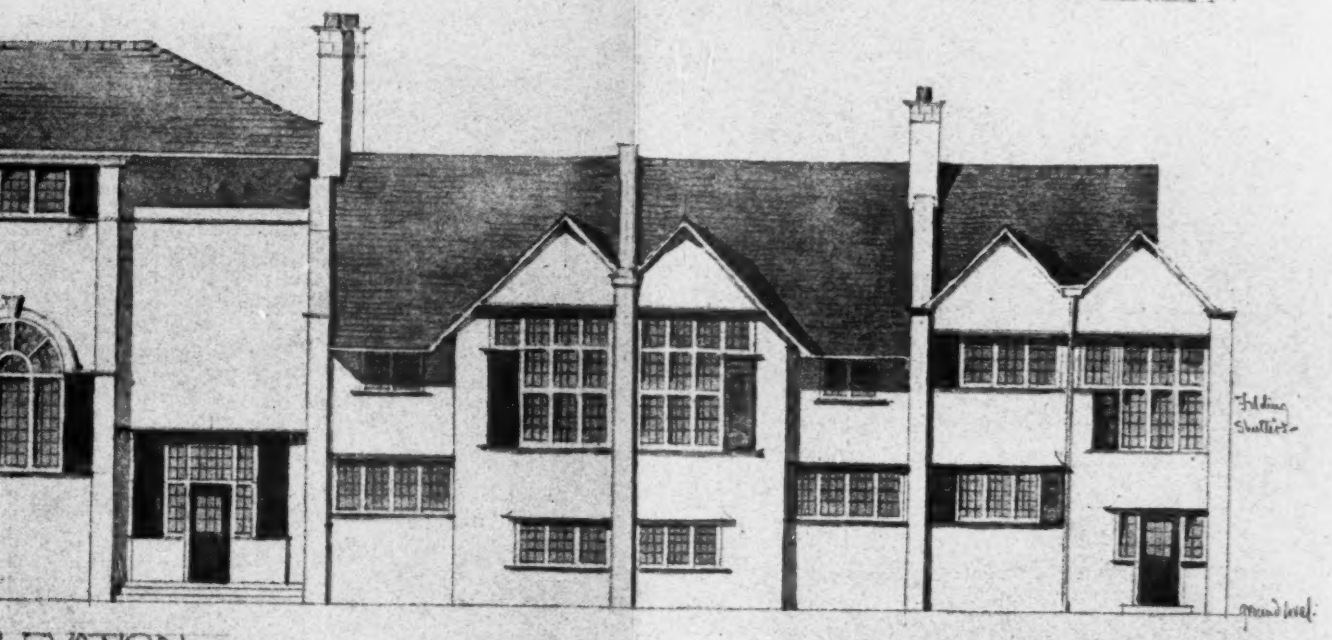

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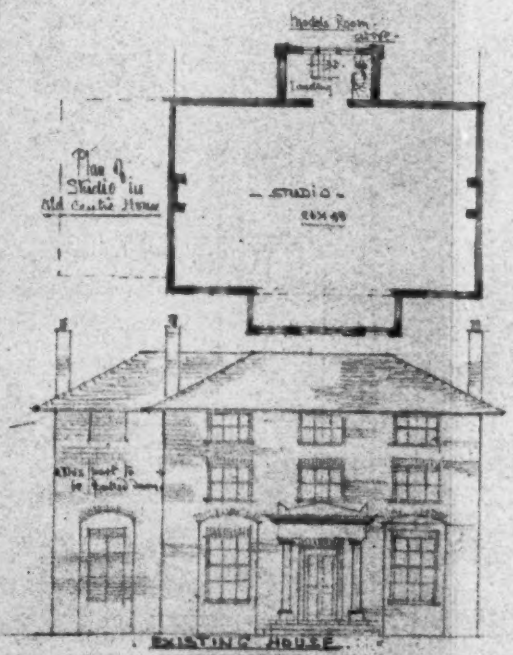

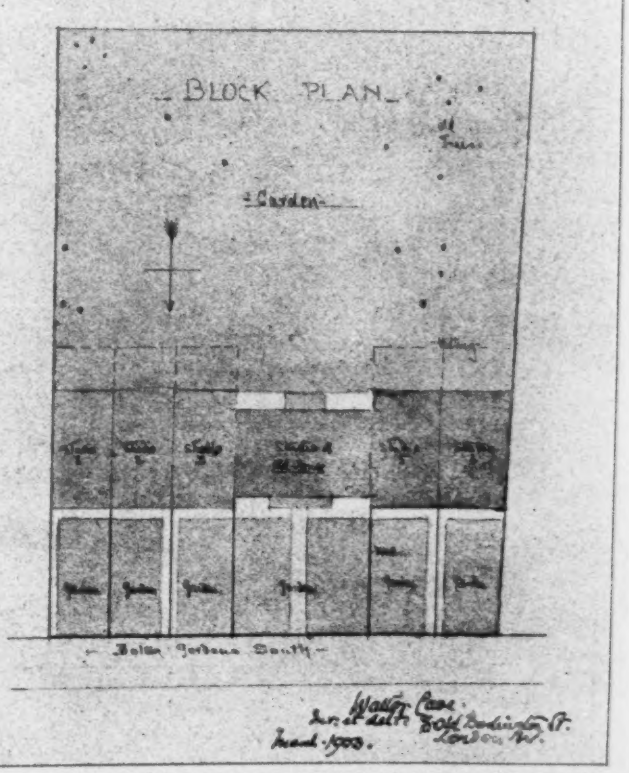

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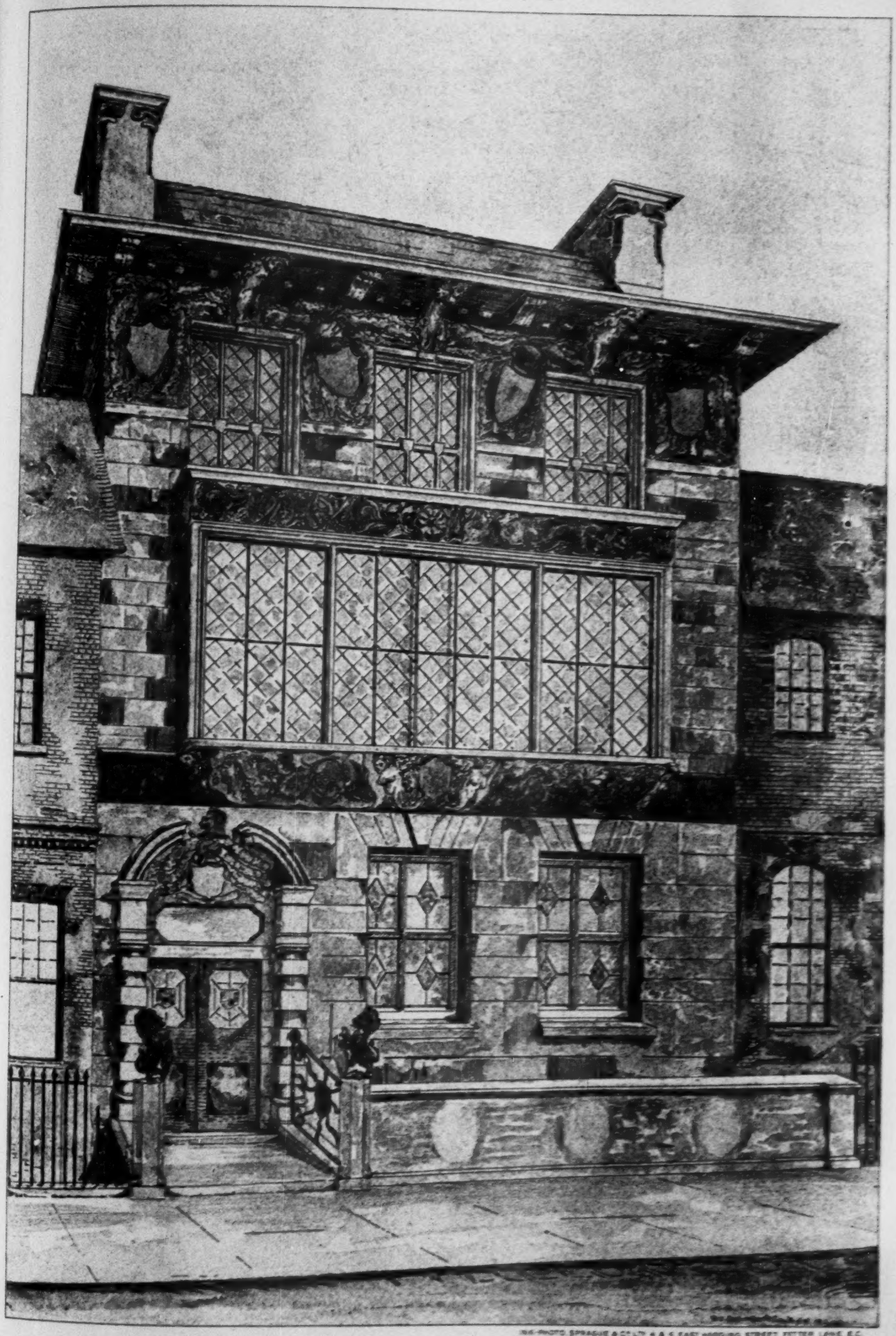
GARDENS SOUTH.—MR. WALTER CAVE, ARCHITECT.

INK-PHOTO. SPRAGUE & Co LTD 4 & 5, EAST HARDING STREET, FETTER LANE, E.C.

VILLA, SANDIACOE, DERBYSHIRE.—Mr. J. R. Poyser, Architect.



DESIGN FOR A TOWN HOUSE IN HAM HILL STONE AND BRONZE.—By Mr. H. V. C. Smith.

rates and market dues in coming into London, that very little is left for the farmer who produces it.

The Garden City has regulations which will prevent the agricultural land being forced to a great distance from the city by suburbs. This will also create a new interest for the agricultural labourers, and give them the benefits of having a town close to them.

I have no doubt of the success of the First Garden City. My only fear is that when its success is an accomplished fact there will be great difficulty in the way of acquiring other sites, owing to the prices that will be asked.

GUY M. NICHOLSON.

HOW TO POPULARISE SCULPTURE.

SIR,—The announcement that a Society of British Sculptors has been formed will be greatly welcomed by all interested in this, the neglected branch of our art. That it has been neglected by our Royal Academy must be admitted. All should appreciate your kindly notice and sympathy.

It may be a difficult task to get the general public to take an interest in the subject; and I am led to think that, to some extent, this is brought about by the sculptors themselves forgetting the general public. It is not that the general public has absolutely no interest in sculpture, but that it has not been appealed to. What is there to keep alive any interest or pleasure that may once have been created by a visit to the Academy?

The picture lover, though unable to purchase his choice, can at least in many cases purchase for a few guineas an etching or engraving, whilst the lover of sculpture has no such opportunity. If a few works, chiefly the low reliefs, of our eminent sculptors can be reproduced by some worthy student, and, when possible, under the personal supervision of the sculptor himself, and in some cheap material, even plaster—such casts being signed and numbered as etchings are—it would do much to keep alive and cultivate the interests of the general public.

A few years since, there was in the Academy a beautiful low relief, "My Thoughts Are My Children," by Mr. Frampton, and I could not help observing how this appealed to so many; possibly the sentiment attached to it added to the appeal, and I think sentiment must exist in sculpture as in painting, if an appeal is to be made to the general public. Could Mr. Frampton be persuaded to allow this to be reproduced?

I have still on my walls a few plaster casts, which I purchased many years ago at the cost of a few shillings, of works by Thorwaldsen; these are now a source of pleasure. An eminent R.A. once said to me, "A work of art is not depreciated though cast in plaster."

My contention is this: that if the general public could be appealed to, and catered for, by providing it with good reproductions of sculpture, it would show its appreciation, and a greater interest in sculpture would exist.

T. T. GETHING.

BOOKS RECEIVED.

AUTOMATIC SURVEYING INSTRUMENTS. By Thomas Ferguson. (John Bale, Sons, and Danielsson. 4s.)

The Student's Column.

ARCHES.—VI.

REFERRING again to Fig. 36 and to the action of the arch there represented, we may add that the construction of an actual model will enable the student to ascertain for himself the precise manner in which the three voussoirs arrange themselves in accordance with different conditions of the loading and of the reaction of the abutments. The principles governing the action of the three voussoirs in Fig. 36 apply equally to the case of an arch containing a larger number of voussoirs.

In a model designed for this purpose by Professor Fleeming Jenkin the voussoirs are made of wood, with their bed-joints slightly curved and roughened, and the upper ends of the blocks are shaped so that, when no extraneous load is imposed, they form a straight line, while the lower ends form a polygonal intrados approximating to a curve. The roughening of the joints is intended to prevent the blocks from slipping. The model illustrates very beautifully the action of an arch under different conditions of loading. When a load is superimposed at the crown of the arch this part is slightly depressed, owing to the rotation of the voussoirs. The curved line passing through the points of contact approaches nearer to the upper ends of the voussoirs in the crown and nearer to the lower ends of the voussoirs in the haunches. The line passing through the new points of contact represents the equilibrated polygon corresponding with the stated condition of loading.

When the superimposed load is placed over the haunches the crown of the arch is pushed upwards and the haunches are slightly depressed, the points of contact between the voussoirs approaching nearer to the upper ends of the blocks at the haunches and nearer to the lower ends of the blocks at the crown.

When only one haunch is loaded the arch is much distorted, being depressed under the load and pushed up at the other side, while the points of contact rise in the loaded side and fall in the unloaded side.

It will be found that if the model is temporarily distorted by pressure of the hand the arch will, upon removal of the pressure, oscillate up and down on each side of the position of equilibrium, its action in this respect somewhat resembling that of a loaded chain.

In such a model as this each voussoir can be slightly rotated, because the joints are curved, and although in an actual arch the joints have plane surfaces, the voussoirs really turn to some extent in the effort to adapt themselves to the pressure; but the effect of such rotation is only evidenced by unequal compression along the upper and lower parts of the voussoirs. Hence, one edge is more compressed than the other, the two forces, or couple, tending to rotate the voussoir—and actually doing so in the model—being met by an equal and opposite couple, consisting of forces due to the resistance of the material.

Hence we see that an arch ring with plane joints is in a condition of stable equilibrium, and will adapt itself to new conditions of loading very much in the same manner evidenced by the model with curved joints; but in one case the couple called into play is balanced by the opposite and equal couple resulting from the resistance of the stone to angular motion; and in the other the couple is cancelled by the new positions assumed by the points of contact.

We must remember, however, that the limits of loading within which an arched structure will remain in a condition of stability are always determined by the consideration that the linear arch must not pass beyond any joint of the actual arch. For example, if the arch were very heavily loaded over one haunch the linear arch might reach the inner end of one of the joints between the crown and the abutment. This would cause one of the joints in the model to open widely, or, in the case of an arch with plane joints, it would cause excessive stress in the material. If the load were further increased the effect would be the collapse of the arch—in the case of the model, by forcing out one of the blocks, and in the case of an actual arch with plane joints, by crushing the material.

Further, it is necessary to guard against the slipping of the voussoirs at the joints. Safety in this respect can be secured by providing that the direction of the linear arch, or line of pressure, at each joint shall not make an angle with the normal greater than the angle of repose of the material. In a plane masonry joint it can be shown by calculation that the amount by which the resultant of a uniformly varying stress may deviate from the centre of the stressed surface may be one-sixth of the width of the surface without causing reversal of the sign of the stress at the opposite edge of the surface. Hence, the rule is generally adopted in the design of masonry arches that the resultant thrust between adjoining voussoirs shall be kept within the middle third of the joint. The adoption of this rule provides a guarantee that no part of the joint shall be exposed to tensile stress. In the case of a joint formed without mortar, or in which the mortar is inoperative so far as concerns resistance to tension, the effect of permitting the resultant of the stresses to deviate beyond the middle third of the joint would be to place part of the joint out of action, thus throwing the whole of the stress upon the other part. On the other hand, if the line of pressure is kept within the middle third of every joint, all the surfaces are in compression, the stress intensity varying from zero at one end to maximum value at the other. Finally, we may add that all the joints should be of width sufficient to keep the maximum stress intensity within safe limits.

From the foregoing discussion it is clear that the failure of a masonry arch may take place in three ways:—

(1) By rotation about the edge of a joint.
(2) By crushing of the material.
(3) By the sliding of one voussoir upon another.

Figs. 37 and 38 illustrate the failure of an arch

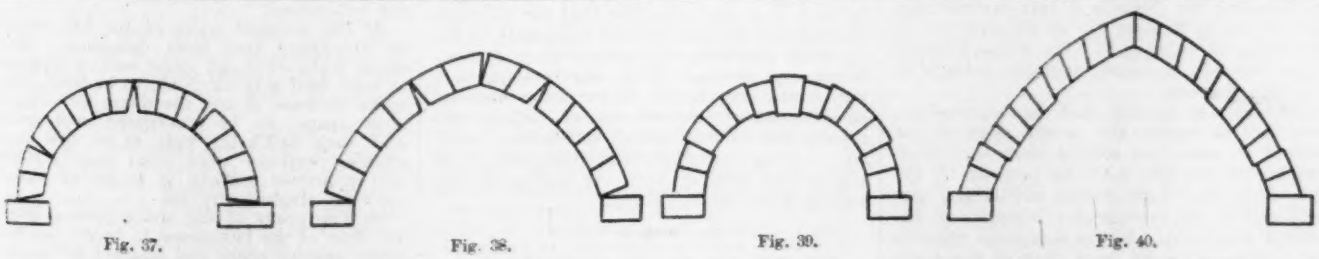


Fig. 37. Fig. 38. Fig. 39. Fig. 40.

THE HAMBRO' SYNAGOGUE.—The new buildings for the Hambro' Synagogue have been erected at a cost of 3,700*l.*, upon a site having a frontage to Union-street, Commercial-road, E., after Mr. Lewis Solomon's plans and designs. The former synagogue was built on the east side of Church-row, Fenchurch-street, in 1736, by Moses (or Mordecai) Hamburger, the eminent Hebrew scholar, and a native of Hamburg. For the site of the synagogue he took the garden of his house in what was then Magpye-alley. The freeholders of the site of about 3,500 ft. superficial adjoining the Church of St. Katharine Coleman agreed to let it upon a building lease for a term of eighty years, and on the evening of November 9, 1692, a valedictory service was held in the old building, which has since been pulled down.

The equilibrated polygon passing through the joints at various distances from the centre indicates the forces acting in a practical arch with plane joints just as much as it does in a model with voussoirs having curved surfaces. It should be borne in mind, however, that in the case of an arch with plane joints, pressure must be unequally distributed wherever the polygonal line fails to pass through the centre of the joint. Variation of elastic resistance in the stone of which the voussoirs are composed corresponds to variation of curvature in the surfaces of joints. Thus, a slight distortion of the arch is sufficient to restore the condition of equilibrium when the stone has a high modulus of elasticity, or when the curvature is great.

by rotation about the joints, and, as will readily be understood by inspection of the diagrams, the method shown in Fig. 37 is more usual in the case of circular and elliptical arches with low crowns than in pointed arches.

The second mode of failure by crushing is evidently closely related to failure by rotation, because, as we have already seen, excessive pressure results from the tendency of the voussoirs to rotate under the influence of the forces applied.

Figs. 39 and 40 represent the third mode of failure. In Fig. 39 the crown slips down and the haunches slip out; while in Fig. 40 the reverse takes place. In arches where the rise is less than the span the crown generally slides

down as in Fig. 39; but where the rise is greater than the span the haunches are usually forced inward, as in Fig. 40.

To insure safety against failure by rotation it is necessary that the line of resistance shall be entirely within the intrados and extrados of the arch. An arch built of rigid voussoirs will not fail by rotation in the manner illustrated by Fig. 37 unless the line of resistance meets the intrados at two points, one on each side of the arch, and the extrados at one point in the crown. Similarly, an arch will not fail by rotation, as shown in Fig. 38, unless the line of resistance meets the extrados at two points in the haunches and the intrados at one point in the crown.

The factor of safety to be employed for guarding against failure by overturning, or rotation about any point, is equal to half the length of the joint divided by the distance between the centre of pressure and the centre of the joint; or expressed algebraically:—

$$\text{the factor of safety} = \tfrac{1}{2}\, l \div d \quad \ldots\ldots\ldots \quad (1)$$

where l is the length of the joint, or distance measured from the intrados to the extrados; and d is the distance between the centre of pressure and the centre of the joint.

If we assume the centre of pressure to be at the boundary of the middle third of the joint between two voussoirs we have $d = \frac{1}{6} l$. Hence, by the above equation the value of the factor of safety is three. Or, if we assume the centre of pressure to be at the distance $\frac{1}{4} l$ from the middle of the joint the value of the factor of safety is two.

We have already stated that it is usual in practice to provide that the linear arch, or line of resistance, shall lie within the middle third of every joint in the arch ring. This is equivalent to the requirement that the factor of safety shall have a minimum value of three, to insure safety against failure by rotation.

Turning attention to stability against crushing of the material, and assuming that the total pressure on any joint and the centre of pressure are known, the maximum pressure at any part of the joint selected may be calculated by the equation:—

$$P = \frac{W}{l} + \frac{6\,W\,d}{l^2} \quad \ldots\ldots\ldots\ldots \quad (2)$$

where P = the maximum pressure on the joint per unit area; W = total normal pressure on the joint per unit length of the arch; l = depth of the joint; and d = distance from the centre of pressure to the middle of the joint.

This equation is applicable to masonry able to withstand tension, or to masonry assumed to be unable to withstand tension, providing in the latter case that the value of d is not greater than the value of $\frac{1}{6} l$.

For masonry incapable of resisting tension, and when d is of greater value than $\frac{1}{6} l$, the following rule should be used for determination of the maximum pressure:—

$$P = \frac{2\,W}{3\,(\frac{1}{2}\,l - d)} \quad \ldots\ldots\ldots\ldots \quad (3)$$

Computations may be simplified by drawing the line of resistance for the arch to be considered as in Fig. 35. The maximum pressure can then be ascertained (*a*) by resolving the resultant reaction perpendicular to a given joint, (*b*) by measuring the distance d, then substituting these values in formula (2) or (3), and (*c*) by calculating the value of P. The proper formula for use depends, of course, upon the value of d, as explained above.

In addition to the rule that the line of resistance shall be within the middle third of the joint it is usual to require that the result obtained by dividing the total pressure by the area of the joint surface shall not exceed one-twentieth of the compressive strength of the material employed. As the maximum pressure has a value equal to twice that of the mean pressure, the above stated requirements have the effect of limiting the maximum pressure to one-tenth of the crushing resistance of the material.

With regard to permissible working stresses, it may be said that the present state of knowledge as to the strength of stone and masonry makes it difficult, or impossible, to fix upon values that shall be both safe and economical. No reliable data are available as to the crushing strength of masonry under working conditions. The results hitherto obtained relate to the crushing strength of masonry for loads perpendicular to the surface, and there are no data throwing light upon the effect of the component of the pressure parallel to the surface of the joint. Generally, it is safe to assume that the crushing strength of masonry is considerably less than that of the material of which it is composed.

It should be observed that the distance of the centre of pressure from the centre of the joint does not alone determine the crushing of the masonry, for this result also depends upon the ratio between the mean pressure on the joint and the ultimate strength of the stone. If the mean pressure should be very nearly equal to the crushing strength, a slight variation in the position of the centre of pressure may cause failure of the voussoir, but if the mean pressure is small a considerable variation of position may take place without crushing the stone.

Further, it does not follow that the partial crushing of a voussoir necessarily endangers the stability of an arch, but if the centre of pressure approaches so near to the edge of a joint that too large an area of the stone becomes crushed the whole voussoir will fail, thus causing the total collapse of the arch.

From what we have stated above, it is clear that if the line of resistance passes outside the middle third of each joint, reversal of the sign of the stress will take place at the opposite edge of the joint surface, or, in other words, the opposite edge of the joint will be in tension. If lime mortar were employed, the result would be the opening of the joint, but with cement mortar joints a considerable amount of tension can be resisted, and it does not necessarily follow that the joint would be opened by reason of tension.

The existence of an open joint in an arch, although an indication that the line of resistance lies outside the middle third of the joint in question, does not imply that the stability of the arch is endangered. An open joint is not necessarily a serious matter. If occurring in the extrados, however, it may afford access for water, the freezing of which might do serious injury. Hence, it is usual to protect the extrados of masonry arches by clay puddle or other impervious material.

Resistance to sliding is afforded in practice by adhesion of the mortar and by such an arrangement of the joints that the angle made by the line of resistance with the normal shall be less than the angle of repose of the material. The coefficient of friction of masonry when the mortar is wet is about 0·50, corresponding to an angle of repose of 25 deg. Consequently, there is a possibility that one voussoir would slide on another if the angle made by the line of pressure with the normal were to exceed 25 deg. In practice, this element of danger is avoided by making the joints of the arch ring as nearly perpendicular as possible to the line of resistance. When this course is followed, very little reliance is placed upon frictional resistance or upon the adhesion of the mortar.

If the design were such as to make the angle between the line of resistance and the normal greater than the angle of repose the stability of the arch would depend upon the adhesion of the mortar, assuming the full load to be imposed. Under ordinary circumstances, an arch rarely, if ever, receives its full load before the mortar has set, but it sometimes happens that severe strains are caused by cranes used by the contractors during construction, and if lime mortar be used it is quite possible that the adhesion thereby afforded will not add sufficiently to the frictional resistance of the material to prevent failure by slipping. This consideration is a very strong argument in favour of the universal employment of cement mortar, which sets rapidly and thereby affords satisfactory assurance of security during construction, and especially in wet weather when the setting of lime mortar is necessarily delayed.

COURT OF COMMON COUNCIL:

BAKEHOUSES.

THE usual fortnightly Court of Common Council was held at the Guildhall on Thursday last week.

The officers for the year were elected, among those re-elected being Mr. Andrew Murray, Surveyor, and Mr. David James Ross, Engineer.

On the recommendation of the Streets Committee, it was agreed to offer no objection to a proposal of the London County Council to alter the position of the fire escape in Bartholomew-close, the cost of altering the shape of the refuge being borne by the Council. The same Committee recommended, and it was agreed, to grant the General Post Office authorities permission to take up the carriageways and footways of Newgate-street, Watling-street, Charterhouse-street, and Carthusian-street, for the purpose of laying certain telegraph pipes, providing that the work be carried out continuously day and night. Mr. Alpheus C. Morton, the Chairman of the Committee, was re-appointed to represent the Corporation on the Committee of Metropolitan Local Authorities on material and means of paving the streets of London.

The Sanitary Committee submitted a report from the Medical Officer of Health relative to the standard for voluntary sanitary certificates for kitchens and restaurants and above-ground bakehouses. The report stated that the practice of granting certificates as to the sanitary condition of premises had existed for many years in some districts, more especially at seaside resorts. The matter was brought forward by the Medical Officer of Health in June last, in consequence of repeated representations by owners and occupiers, who, having been called upon to carry out repairs, improvements, etc., felt strongly that as some recompense for the outlay they had made they should be in a position to exhibit a certificate that their premises were then in a satisfactory sanitary condition. The general principle was then agreed to by the Committee, and the matter was referred to the Medical Officer to report as to details of standards, etc. The suggestion of the Medical Officer of Health now, was that all owners of kitchens and above-ground bakehouses should be informed that a standard of requirements had been drawn up by the Corporation, and that, upon complying with such, a certificate would be granted to the effect that the premises had been inspected and found in a satisfactory condition. Those inspections could be repeated from time to time, and fresh certificates issued. A precedent for issuing such certificates was furnished by the Customs and Inland Revenue Act, 1890, in the matter of houses let in tenements. The experience gained in dealing with underground bakehouses under the Factory and Workshop Act, 1901, was of considerable value in that connexion. Generally speaking, the main points for consideration did not differ materially in kitchens or bakehouses, underground or above ground. Thus, to insure the utmost cleanliness, the walls, floor, and ceiling were required to be impervious, the walls being as little encumbered as possible by shelves or other obstacles placed against them. That enabled the place to be thoroughly washed down and cleansed effectively and expeditiously. In the case of kitchens the proper storage of almost every class of perishable food had to be dealt with. It was, therefore, desirable that a separate store-room should be provided for the purpose. It was also a great advantage to have a separate room as a scullery for washing up, etc. In many cases it would be difficult to comply with all those obvious requirements. The standard, therefore, should not be so rigidly enforced as to press unduly on persons willing to comply as far as possible with its spirit. In submitting the following standards, the Medical Officer of Health recommended that the Committee should not refuse a certificate because the conditions could not in all respects be complied with:—

Bakehouses Above Ground: Standard for Voluntary Certificates.—I. *Construction.*

(1) Floors, walls, and ceilings to be finished to a hard, smooth surface, impervious to moisture.

(2) When practicable, the floor of the bakehouse to be laid to proper falls, and be drained by suitable channels leading to a gully outside the bakehouse.

(3) The finished walls of the bakehouse to be absolutely free from dampness. Should damp walls exist, an inner wall of brickwork, at least half a brick thick, to be built, with a space between it and the damp wall of 2 in., such space to be ventilated and drained, and such half-brick wall to be tied to the existing wall—or some other equally efficient and approved method is to be adopted for insuring absolute dryness.

(4) The joints of any drain passing beneath the floor of the bakehouse to be gas and water tight, and all pipes and sanitary fittings to be of the most efficient and approved type. Covers to inspection chambers to drains to be of metal, and to be double covers, both covers having an efficient seal.

(5) The bakehouse to be a minimum height of 8 ft., a minimum cubic capacity of 1,500 ft. clear of the ovens, and of any flour stored in the bakehouse, and not less than 400 cubic ft. per head for each workman employed therein.

II. *Lighting.*

(6) Where practicable, natural light only should be utilised. In cases where artificial illumination is a necessity, electricity is to be preferred, and when gas is used the incandescent type of burner, properly protected from flour dust, should be adopted, together with ample means for carrying off the products of combustion from the same.

III. *Ventilation.*

(7) The method of ventilation to be such as to insure a constant and efficient change of air without producing draughts, and, in order that the temperature of the bakehouse shall not exceed 80° Fahr., except during the half hour after a batch of bread has been drawn. Where a fan or other mechanical appliance is necessary to effect this it must be provided.

(8) The furnace in connexion with any oven to be provided with an efficient outlet or flue to carry off sulphurous fumes generated in the process of baking; an outlet for heat and steam to be provided immediately in front of and above the oven door; the outer door of furnaces and ovens to be perfectly close fitting.

(9) Proving ovens, where necessary, are to be efficiently ventilated. Where gas is used in the process of baking, means to be provided for carrying off the fumes generated.

IV. *Generally.*

(10) Proper provision to be made for the storage of flour elsewhere than in the bakehouse, if practicable.

(11) Lavatory basins to be provided in a suitable position, outside bakehouse if possible, for the personal ablution of hands employed.

(12) Suitable water-closet accommodation to be provided for the hands employed.

(13) Storage (water) cisterns to be of the most approved type, with dust-tight fixed covers.

(14) Provision to be made for hanging wearing apparel (not worn by staff during working hours) in a suitable place outside bakehouse.

(15) Flour not to be deposited immediately on the floor, but to be stacked upon small trestles or a wooden platform raised 12 in. above the floor.

(16) All dough troughs, benches, etc., in bakehouse to be provided with casters, where necessary, to render them easily moveable.

(17) Any shelves necessary to be fixed 2 in. away from walls, and all unnecessary woodwork to be removed from walls.

(18) Jet and hose to be provided, with the necessary connexion to a proper water supply, for washing down the bakehouse in an efficient manner.

(The above standard may, on application by the proper parties, be modified in any cases where the Committee may consider there are special circumstances that justify a modification.)

In the case of kitchens of restaurants, the provisions were the same, with the addition of a provision that "hoods be placed over all stoves and ranges to carry off fumes and heat, such hoods to be in direct communication with the external air by means of a shaft or flue." On the recommendation of the Committee the provisions were agreed to, and the Committee was authorised to issue certificates accordingly.

ROYAL COMMISSION ON LONDON LOCOMOTION.

A FURTHER sitting of the Royal Commission was held on Thursday last week, under the Chairmanship of Sir David Barbour.

Mr. W. G. Shadrake (Chairman of the Leyton Urban District Council) described the tramways at present existing in the district, and said it was the intention of the Council to purchase these lines and construct new lines, to give intercommunication with the lines of the West Ham Corporation and the Walthamstow Urban District Council, and, if possible, with those of the L.C.C. at Clapton. The only railway serving the district was the Great Eastern, and they would hail with satisfaction the construction of a tube railway, such as the suggested City and North-East Suburban Electric Railway.

Mr. R. H. Scotter, C.E., a member of the Council of the Tramways and Light Railways Association, gave evidence as to the practice prevailing in foreign countries as to the granting of concessions to promoters of tramways and light railways. With regard to London, he advocated the establishment of a tribunal similar to the Light Railway Commission, which would consider all tramway, light railway, tube railway, and subway schemes. Such a tribunal should be strengthened by the addition of expert engineers of world-wide experience, able to advise both theoretically and practically upon the various traffic problems as they came before the Commission.

NEW COUNCIL HALLS.—It is stated that the Holborn Borough Council have approved of a project for the erection of a new Town Hall for the borough, at an estimated expenditure of nearly 100,000*l.*, and that the Stepney Borough Council have under their consideration a scheme for a similar purpose, in view of the inadequate and inconvenient accommodation in their existing offices, which are scattered in various parts of the borough.

WESTMINSTER CITY COUNCIL.

THE usual fortnightly meeting of this Council was held on Thursday last week at the City Hall, Charing Cross-road.

The Finance Committee reported the receipt of a letter from the Local Government Board, sanctioning the borrowing of 4,300*l.*, for the reconstruction of slipper baths at the Marshall-street Baths. On the recommendation of the same Committee it was agreed to apply to the London County Council for sanction to borrow 6,000*l.*, for the purpose of defraying a moiety of the cost of paving works in Oxford-street, 1,196*l.* for the purposes of the contributions made by the City Council in connexion with the Roehampton-street improvement, and 2,763*l.* to defray the cost of certain sewer works.

Amendments to By-laws.—On the recommendation of the General Purposes Committee the following amendments of by-laws 144 and 145 were agreed to and confirmed:—

i. The supervision of all drainage works which are required to be executed pursuant to a Nuisance Notice or Order; and the construction of all water-closets, soil pipes, and other apparatus which are the subject of the provisions of the Public Health (London) Act, 1891, and the by-laws made thereunder; and the approval of all plans relating thereto shall stand referred to the Committee (*i.e.*, the Public Health Committee) and the Public Health Department.

ii. He (*i.e.*, the Medical Officer of Health) or officers duly authorised by him, shall visit daily the Works Department, and shall inspect all drainage plans and notices of drainage plans, water-closets, and soil pipes, and shall afford to the City Engineer such facilities of access to drainage plans and notices of drainage plans, etc., in the Public Health Department, and to the possession thereof, as may be necessary for the due compliance with the by-laws and standing orders.

Abolition of the Office of Chief Sanitary Inspector.—The Committee further reported that they had come to the conclusion that the Sanitary Inspectors should be under the direct control and supervision of the Medical Officer of Health, and that the office of Chief Sanitary Inpector should be abolished. Recommendations to that effect were agreed to.

Underground Dwellings. — The following report by the Medical Officer of Health was submitted by the Public Health Committee:—

"When the City was re-incorporated, it was found that, whereas in all the other parts of the City the use of underground dwellings had not been permitted, in St. James's parish a number existed. In view of the difficulty experienced by the poorer classes in obtaining other more suitable living accommodation in the district, the Council resolved (under the powers given by the Public Health (London) Act, section 96, sub-sections 3 and 4), not to turn out the occupants of these dwellings all at once, but ordered a list to be prepared, and an examination made, with a view to prevent the use of such dwellings as, in my opinion, should be closed at once, and with regard to the remainder, notices were to be served on the owner that in the event of their becoming vacant, they were, on no account, to be relet separately for living purposes.

"The use of such dwellings has been gradually decreased in accordance with the instructions of the Council, with the result that of the original number only five basement rooms are now occupied separately. Notices have been served with reference to the illegal use of underground rooms in 1901 in twenty-five instances, in 1902 in thirteen instances, and in 1903 in nineteen instances. It should be pointed out that these figures do not imply that in every case the use of the underground room has been given up for living purposes. The law still permits the use of an underground room, so long as it is occupied in conjunction with a room on another floor."

On the recommendation of the Works and Sewers Committee, amended plans of vaults to be constructed at the new motor generating station of the Westminster Electric Supply Corporation at Duke-street-gardens, Grosvenor-square, were approved. The report of the Committee referred to a letter received from the London County Council, on the question of the condition of railway bridges, and stating that any steps taken under sections 46 and 47 of the Railway Clauses Consolidation Act, 1845, must be at the instance of the local authorities. There was only one case in regard to which the Council considered it desirable to take action. The case was the bridge over the Grosvenor-road, where improvements were necessary to prevent the percolation of water. The Committee recommended, therefore, and it was agreed, that representation be made to the railway companies concerned, with a view to the improvement suggested by the City Engineer being carried out. The Committee further reported on a letter received from the Superintending Architect to the London County Council, stating that the attention of the Council had been drawn to the fact that the circus at the intersection of Regent-street and Oxford-street was known as both Regent and Oxford circus, and suggesting that the name Regent-circus should be dropped and that of Oxford-circus retained. The Committee agreed to this, and recommended that the Superintending Architect be informed that the City Council was in accord with the proposal put forward. This course was adopted.

OBITUARY.

M. CORROYER.—We regret to have to record the death, at the age of 67, of M. Edouard Corroyer, a French architect of considerable distinction, and who had been a favourite and favoured pupil of Viollet-le-Duc. M. Corroyer was for fifteen years the resident architect in charge of the Abbey of Mont. St. Michel, from which post he was removed in 1888, ostensibly in consequence of his strong opposition, on antiquarian grounds, to the Government proposal to change the original position of the dyke connecting St. Michel with the mainland; but it is probable that political or anti-clerical feeling had something to do with the removal of an architect whose sympathies were too clerical and mediæval to find favour in the eyes of an essentially rationalist Government. M. Corroyer wrote a valuable monograph on the buildings at Mont St. Michel and was author also of a work on Gothic architecture, remarkable both for its ability and interest and for the novel and rather questionable character of some of the theories embodied in it; for instance, as to the derivation of the Gothic cross-vault from the domed roofing of the churches of the south of France. The book was also misleading as to English Gothic, the monuments of which the author did not appear to have studied from personal observation; but, in spite of these drawbacks, it is a work of permanent interest. M. Corroyer was architect of the Hôtel de Ville, of Roanne, of the churches of Vougy, Villiers, and St. Cyr-les-Vignes, and of some splendid châteaux in the departments of the Aire and the Loire. He directed also the reconstruction of the Comptoir d'Escompte, and the restoration of the Cathedral of Soissons. M. Corroyer was a member of the Académie des Beaux-Arts, and "Officier" of the Legion of Honour.

GENERAL BUILDING NEWS.

MEMORIAL HALL, BURNHILL, NEAR PATSHULL.—A new memorial hall has been erected by Lord Dartmouth at Burnhill Green, near Patshull, for the recreation and entertainment of those living on and about the Patshull estate. It has been built as a memorial to the late Earl and Countess of Dartmouth. The hall has been erected from the designs of Messrs. John Weller and Sons, architects, Wolverhampton. It consists of a hall capable of accommodating (exclusive of the platform and gallery) some 200 persons, and to it is attached a caretaker's house. The building has an open timbered pitch-pine roof, stained and varnished. The structure is built with bricks made on the estate, the exterior being half-timbered and rough-cast. The hall is lighted by a bay window at each end and five side windows, all glazed with leaded glass.

HALL AND LIBRARY, EDINBURGH.—The Nelson Hall and East Branch Library, M'Donald-road, Edinburgh, was opened on the 18th ult. by the Right Hon. Sir Herbert Maxwell, Bart., M.P. In designing the building, advantage has been taken of the obtuse angle made by M'Donald-road and Leith-walk to bring out the front in a series of projections. A further feature of the exterior is a tower at the corner, and the large mullioned windows lighting up the principal rooms. Towards Leith-walk the building is three stories high, the two upper flats being set apart as houses for a librarian and a caretaker. Entering the building, immediately in front is the lending library, with accommodation for 20,000 volumes. The Nelson Hall occupies the largest portion of the building, and it is intended to be both a recreation and a news room. It measures about 76 ft. long by 50 ft. wide, divided with columns and arches, and has an open timber roof. To the left of the library there is a reading-room. On the upper flat a gymnasium has been provided, while on the basement there is a hall for small meetings. Mr. H. R. Taylor was the architect.

NAUTICAL SCHOOL, PORTISHEAD, SOMERSETSHIRE.—According to the *Bristol Times and Mirror*, 30,000*l.* will be spent upon the Nautical School for Lads which is to be erected at Portishead to take the place of the training ship Formidable. The site is at the end of the Nore-road, where fifteen acres of land belonging to the Corporation have been secured on lease at a nominal rent. A sketch of the front elevation has been prepared by Mr. Edward Gabriel, the architect, from which

some idea of the structure may be gathered. It will be 300 ft. in length, and will rise 45 ft. from the parade ground, the idea being to give as much light and air as possible. In order to secure a proper level for the school, there will be constructed a basement, of local stone, the whole length of the building, and the apartments thus provided will be used as carpenters', tailors', shoemakers', and other shops, laundry, and for storage purposes. The roof of the basement is to be covered with a paving of patent concrete, and will serve as a parade ground, 40 ft. wide. From this level is to rise the school, a building of three stories, faced with Ionic pilasters of red brick (between the windows) and white rough cast, the roof to be covered with red Bridgwater tiles. The structure will really consist of two blocks, united by a central square tower, through which is the main entrance. Around it is an ornamental doorway, at the top of which are figures of Neptune and Britannia. The tower, which is to contain a clock, rises to a height of 70 ft., finishing with a wood and copper flèche. There are to be small towers at the corner of each main block, in which are to be the staircases for the lads. The two upper floors are to be used as dormitories, and from each dormitory there will be two staircases for use in case of emergency. The entrances for the boys are to be on each side of the central tower. The ground floor of the west block is intended for the purposes of a mess-room for the boys and officers' mess-room, with kitchen, scullery, and stores in the rear. At the west end of the block are to be the chief officer's house and rooms for the resident schoolmaster. The school-room and class-rooms, teachers' room, and library are to be on the ground floor of the east block. At the rear of this block is to be a bay for sick boys, for which a separate cottage hospital will be hereafter substituted if funds be forthcoming. At the extreme east of the building is a gabled residence for the captain-superintendent, which will be connected by a covered way with the main building. The centre block is to contain committee rooms on one side of the main entrance, and offices for the captain-superintendent on the other side. On the second floor there are to be spare cabins for officers and any old boys who may hereafter visit the institution. Each dormitory will have four officers' cabins, from which the whole of the dormitories can be seen. Passing through the main entrance, access will be gained to the gymnasium, which is to be in the centre of the building at the rear. The apartment, the dimensions of which will be 80 ft. by 50 ft. and 20 ft. high to the springing of the roof, may be also used for meetings, or for services when weather may prevent the boys attending church. The floors of the dormitories are to be of solid balk timber, tongued together, to resemble the deck of a vessel as much as possible. The lads will sleep in hammocks, as on board ship. Careful consideration has been given to the question of drainage. It will be carried to the north-west corner of the site, to septic tanks, and there be treated on the principle devised by Mr. F. W. Stoddart, and the effluent will be taken into the sea. The rainwater is to be collected in large tanks beneath the central part of the building, and will be used for the laundry and for the boilers. Water for culinary and drinking purposes may be obtained from the mains of the Portishead Water Company, or from a well. The institution is to be warmed by hot water, passing through low-pressure pipes. Accommodation will be afforded for from 350 to 400 boys. Tenders have been accepted from Messrs. Cowlin for carrying out the whole of the scheme.

ST. LUKE'S CHURCH, THORNABY.—The consecration of St. Luke's Church, Thornaby-on-Tees, has just taken place. The building is complete as to the ground floor, but the upper portion of the tower is wanting, and the whole of the roofs are without any internal wood finishings. The walls are of stone faced with snecked blockers inside and out. The plan consists of nave and aisles, transepts, chancel, morning chapel, and vestries, the extreme length being 111 ft., and the width across transepts 75 ft. The morning chapel is under the tower. The arrangement at the east end consists of two tiers of three windows, all of which are round-headed, with the exception of the centre window in the upper tier, which is lancet-headed. In the interior detached shafts with caps and bases are provided between the windows supporting the label mouldings. There is also a rose window in the west gable. The internal wood fittings are of pitch-pine. Sitting accommodation is provided for 700. The floors under seats are of redwood blocks, the passages are in red cement, and the sacrarium is paved with alternate squares of red and white Mansfield stone. The church is lighted with incandescent gas, by Mr. Downing, Thornaby; and heated by hot water on the low-pressure system, the apparatus being supplied by Messrs. Blakeborough and Rhodes, Stockton. The designer of the church was the late Mr. W. S. Hicks, and it has been completed under the superintendence of the present firm of Messrs. Hicks and Charlewood, architects, Newcastle. The builder is Mr. Henry Harwood, of Manfield, near Darlington.

WESLEYAN CHAPEL, SWANSEA.—The new Wesleyan Chapel, situate in St. Albans-road, Brynmill, Swansea, has just been dedicated. The building, which will accommodate 400 adults and 500 children, has a stone frontage. The woodwork interior is of pitch-pine, and heated with hot water apparatus and lighted by gas. The whole structure cost 1,500*l.* and the architect was Mr. W. Beddoe Rees, Cardiff, and the builders were Messrs. J. and G. Jones, Swansea. It was decided to erect the school first, which provides accommodation for 500 scholars. On the ground floor transepts are provided on each side, in which is a gallery. Under the galleries two class-rooms can be made on each side by movable partitions. At the rear three additional class-rooms are provided on the ground floor, and three over, on a level with the galleries. In all ten class-rooms are provided. A heating apparatus is provided, as well as fire-places in each class-room. The glazing is in cathedral glass, and the buildings throughout are lighted by gas. The scheme, when completed, will cost about 6,000*l.*

WESLEYAN CHURCH, LOWESTOFT.—A new Wesleyan Church, situate at the London-road end of Lorne Park-road, Lowestoft, has just been opened. The building is designated a school-chapel, and a portion will eventually be thrown into the church. The present building is 36 ft. wide, 53 ft. long, and 36 ft. high, to the centre of the ceiling; it is built of red brick, with white stone dressings. Internally the walls are of plaster, with a pitch-pine roof, hammer beam trusses, and plaster ceiling. The gallery has a stone staircase, and the building two entrances—one in Lawson-road and the other in Lorne Park-road. The architect was Mr. G. E. Smith, of Southsea, and the builders were Messrs. Smith and Wolff, of Lowestoft, the stonework being supplied by Messrs. Wolff and Brown, also of Lowestoft. The church has seating accommodation for 400 worshippers.

WESLEYAN CHURCH, SALTBURN.—On the 25th ult. the foundation stones of a new Wesleyan church were laid at Saltburn. The style of the new edifice, which will occupy a site in the centre of the town, will be late Gothic, and the stone for its construction will be obtained from the Pately Bridge quarries, the roofs being covered with red tiles. A feature of the external design is the tower and spire, which rises to a height of 100 ft. The contract for the whole work has been let to Messrs. T. Dickinson and Son, of West Hartlepool and Saltburn, and the structure will be carried out from the designs and under the superintendence of Messrs. Garside and Pennington, architects, of Pontefract and Castleford.

PUBLIC LIBRARY, CIRENCESTER.—The foundation-stone of a new public library at Cirencester was laid recently by Earl Bathurst, C.M.G. The new building will be Tudor in style, and will consist of a news reading-room, a games and smoking room, etc. Mr. V. A. Lawson, A.M.Inst.C.E., Cirencester, is the architect, and Mr. G. Drew, also of Cirencester, the builder.

ST. MATTHEW'S CHURCH, COCKINGTON, TORQUAY.—St. Matthew's Church, Chelston, in the parish of Cockington, has been structurally completed, and dedicated. The selection of the design was made by the editor of the *Builder*, and his choice fell upon that of Mr. (now Sir) Charles A. Nicholson, of London. The building was illustrated and described in our issue for June 30, 1894. The first part of the church was erected by Messrs. R. F. Yeo and Sons, the second part by Messrs. E. P. Bovey and Son. Messrs. Jenkins and Son constructed the baptistry and font. The carving of the choir stalls was executed by Mr. H. K. Kuchemann, of Hammersmith. The greater part of the other carving in the church, including the pulpit, is the handiwork of Mr. Read, of Exeter.

WORKHOUSE, STOURBRIDGE.—The foundation-stone of the new Workhouse for Stourbridge Union was laid on the 22nd ult. The contract for the Workhouse buildings is 95,500*l.*, and for the children's quarters about 10,000*l.* The architect is Mr. Marshall.

INSTITUTE, NEWPORT, MON.—The new Church Institute built as an adjunct to and almost adjoining St. John the Baptist Church at Newport, has just been opened. It has been built by Mr. E. C. Jordan, of Newport, from plans by Messrs. Lansdown and Griggs, architects, of Newport. Built largely of red brick upon a site given by Lord Tredegar, the new hall has a seating capacity of about 200. There is a ground floor space of 40 ft. by 30 ft., a platform of 26 ft. by 30 ft., and an underground school-room of 30 ft. by 20 ft.

CHURCH, BEN RHYDDING.—It has been decided to build a church at Ilkley, to seat from 300 to 400, at an estimated cost of 3,000*l.* (exclusive of the land). A site has been purchased at a cost of 650*l.*, and plans have been prepared by Mr. H. S. Chorley, architect, Leeds.

INSTITUTE, LEEDS.—The Victoria Memorial Institute, which has been erected at Potternewton, Leeds, is now completed. The new building has been designed by Mr. Percy Robinson, and the cost has been about 3,500*l.*

POLICE STATION AND FREE LIBRARY, LEEDS.—The Police Station and Public Free Library which has just been provided for the Chapeltown suburb of Leeds, was opened on the 28th ult. The architect was Mr. W. H. Thorp.

POLICE COURT, WESTMINSTER.—The new Westminster Police Court building in Rochester-row, the estimated cost of which was 12,000*l.*, erected by Messrs. F. and H. Higgs from the designs of Mr. J. Dixon Butler, Surveyor to the Metropolitan Police, have just been completed. Over the bench is a carved Royal coat-of-arms of early Hanoverian period, which formerly adorned one of the old courts at Westminster Hall.

TRURO CATHEDRAL TOWER AND SPIRE.—On the 22nd ult. the benediction ceremony took place of the tower and spire of Truro Cathedral, which have been built through the generosity of Mr. J. Hawke Dennis, of Grevehurst Park, Capel, Surrey, and formerly of Redruth, at a cost of nearly 15,000*l.* The tower is square on plan. Above the roofs it is divided into two unequal stages, all four sides, except for the slight variation in width, being alike. The lower or lantern stage is the smaller of the two, and has three two-light windows, deeply recessed in three orders. These windows are visible from the inside of the church, and form the lights of the lantern, the vaulted ceiling of which comes immediately above them, rising about 35 ft. above the vaulted ceiling of the nave. The upper or belfry stage also has three two-light windows, but these are of much taller proportion; they are also more deeply recessed, and are filled with oak louvres covered with copper. The heads of these windows are crowned by sharply-pointed gables, which finish under the overhanging corbel course, which comes immediately under the tower parapet. This parapet is pierced and traceried, and is divided into three sections corresponding to the windows below by miniature buttresses. The height to the string under the lower parapet is 156 ft. The spire rises in simple and unbroken outline from a rich cluster of pinnacles, and spire lights which are grouped round its base. The four angle pinnacles are hexagonal on plan, panelled in two stages with coupled lancets on each face, and capped with slender spires. They are connected to the central tower by a web of stone, which is gabled and panelled. There is an elaborate spire-light in the centre of each of the four cardinal faces of the spire, with tall clustered shafts supporting the traceried head. The total height to the top of the spire is 250 ft. Carved on the pier of the tower is an inscription.—*Western Morning News.*

CAMPDEN HILL COURT.—We are informed that the amount of Mr. C. Gray's contract for Campden Hill Court (D. & E. Blocks) is 58,100*l.* and not 56,100*l.*, as stated in our last issue.

SANITARY AND ENGINEERING NEWS.

SEWAGE SCHEME, FOLESHILL.—At Foleshill Workhouse, on the 26th ult., Mr. W. O. E. Meede King, Local Government Board Inspector, held an enquiry into an application of the Foleshill Rural District Council to borrow 27,000*l.* for the purpose of sewerage and sewage disposal. Dr. Bostock Hill (the County Medical Officer of Health) and Mr. Nicolson Lailey (Engineer, who had prepared the scheme), were among those present. Mr. Oswin, the Clerk, explained that a tender had been provisionally accepted amounting to 20,497*l.*, and the amount to be borrowed would cover all contingencies. Mr. Lailey described the scheme in detail, and said some modifications might be made to bring the cost of the scheme within the Council's borrowing powers. The present population who would use the scheme totalled 5,614, and the scheme provided for a population of 8,000.

THE LAND REGISTRY.—Some new regulations have been made by the Land Registry Office which will greatly reduce the cost of registering an absolute title, whilst simplifying the present course of procedure. The registration of an absolute title carries with it an immediate guarantee of validity, and obviates the delays involved by the registration of a possessory title, under which a long period must elapse before the benefit of the registration can be obtained. Thus far, the majority of applications for titles entered upon the general register for the County of London belong to the latter category.

FOREIGN.

FRANCE.—The City of Orléans has opened a competition for the construction of a Museum of Painting and Sculpture, and also for Natural History. There will be a preliminary sketch competition, and the author of the design chosen in the final competition will receive a premium of 100*l.* and be entrusted with the execution of the work. A second premium of 80*l.* will be awarded. The cost of the building is limited to 48,000*l.*; the jury will comprise a representative of the Minister of Fine Arts, a curator of one of the Paris Museums, a member of the Académie des Beaux-Arts, a member of the Conseil des Bâtiments Civils, and two architects to be appointed by the Société Centrale.——The Municipal Council of Bordeaux has definitely voted a demand for borrowing powers to the amount of 1,600,000*l.* for the purpose of various important works connected with new street sewers and drainage, various public and scholastic buildings, and the reconstruction of certain quarters of the town. An agreement has been entered into with M. Albert Soula, banker at Bordeaux, to concede to him, for the sum of 320,000*l.*, a large portion of ground which will become vacant on the pulling down of some old Municipal property, and M. Soula agrees to build on the whole of this ground, before the expiration of six years, the work to be executed exclusively by local labour, a margin of 10 per cent. being allowed for the employment of outside labour for special cases.——The town of Nice has recently organised a series of annual competitions destined to encourage architects and builders to give their best efforts towards the embellishment and sanitation of the town. These competitions are divided into six categories, as follows, three of which take place each year: First, private edifices open to the public, such as churches, schools, convents, theatres, concert halls, hotels, restaurants, works, and shops, etc. Second, private buildings, such as palaces, châteaux, private houses, and the better class of "maison à loyer." Third, ordinary "maisons à loyer." Fourth, economical dwellings. Fifth, smaller works, such as fountains, railings, doorways, shop-fronts, sign-boards, etc., on the public street. Sixth, parks and gardens. Medals of gold, silver, and bronze are to be awarded, and a "plaquette" placed on the premiated work. The awards are distributed between the owner, architect, and artist-gardener.

AUSTRIA.—The foundations have been laid for a new museum for students in Vienna; the building is to contain twenty-one rooms, which are to be divided into sixteen departments; it will also possess a small observatory.——The stage of the Court Opera House is to be reconstructed, as it is too small for modern requirements. The work can only be carried out by degrees, at the season when the Opera House is closed, so it will not be completed for several years.——The Carmelite Hospital is to be pulled down, and a Poor House will be erected on the site.——A new station is to be built at Budweis.——A sufficient sum has been granted at Teplitz-Schönau for the building of a new museum.——The building of the Lunatic Asylum at Trieste has been entrusted to the engineers Comel, Finetti, and Venezian.——The Church of the Annunciation at Pardubitz is to be restored at a cost of 18,000 kreuzers.——The Moldau has been rendered navigable between Prague and Melnik.——Professor Eugen Schwiedland has been appointed Professor of Political Economy at the Technical School in Vienna. Dr. Schwiedland was at one time part editor of the *Revue d'Economie Politique*, which is published in Paris, and which bears an international character.——The sculptor Professor Rudolf Weyr has been entrusted with the execution of a memorial to Hans Canon in Vienna; the statue, which will be larger than life size, will probably be unveiled in the summer.——At the instance of the painter Herr Emil Uhl several artists have approached the Town Council of Karlsbad with the suggestion that a hall should be built, in which exhibitions of art could be held. The subject is under consideration.——The church of St. Wenceslaus, at Prague, is to be restored, under the direction of the architect, Herr Fanta.

GERMANY.—It has been decided to build the new School of Commerce in Cologne according to the plans of Herr E. Vetterlein, which were awarded the first premium.——The annual meeting of the Society of German Architects and Engineers will take place in September at Düsseldorf, where there is also to be an exhibition of landscape gardening.——An important footbridge has been built from the right bank of the river Havel at Spandau to Eiswerder Island. This was found necessary owing to the large number of men who had to be taken across the river twice a day in steamers to and from the Arsenal on the island. The bridge has a span of 200 metres, and the work has been carried out by the firms of Harkort, of Duisberg, and R. Schneider, of Berlin, under the superintendence of Messrs. Richter and Neubert.

SWITZERLAND.—The Corporation of Oerlikon has decided to convert the wooded land near the School Houses into a public park.——The architects Herr Yonner and Herr Jaquillard, of Neuchâtel, have undertaken the extension of the Kurhaus at Interlaken.——The new theatre at Berne is completed; the architect is Herr von Wurstemberger, and the stage machinery has been supplied by the firm of L. A. Riedinger, under the superintendence of C. Lautenschläger.

MISCELLANEOUS.

PROFESSIONAL AND BUSINESS ANNOUNCEMENTS.—The Paul Heater and Condenser Company, of 63, Queen Victoria-street, E.C., have appointed Messrs. Herbert and Gilchrist, 146, West Regent-street, Glasgow, as their agents for the Glasgow district.——Mr. Frank S. Mayo, of 11, Queen Victoria-street, E.C., has been appointed sole London agent for the sale of glazed bricks manufactured by Messrs. James Woodward, of Swadlincote.

HOUSING ACCOMMODATION, PLYMOUTH.—Three months ago a proposal was adopted by the Housing Committee of the Plymouth Town Council, on the initiative of the Chairman (Mr. E. R. Hilson), that, before any further action was taken in regard to increasing the number of workmen's dwellings, a return should be prepared showing the number of vacant houses and tenements in the borough which could be considered suitable for working-class accommodation. For some time past it has been well known that very many of the middle-class dwellings in Plymouth have remained untenanted, and the committee realised that the provision of additional workmen's homes would be calculated to render still more acute the difficulty experienced by builders in getting the unoccupied houses off their hands. The return presented to the Committee shows that on October 19 of last year the number of self-contained houses unoccupied in the various wards at rentals of from 30*l.* to 120*l.* per annum was as follows:—Laira, sixty-five; Vintry, six; Greenbank, twenty; Hoe, eighteen; Compton, fifty-seven; Frankfort, three; Sutton, six; Friary, thirteen; St. Peter's, two; Charles, nine; Drake's, eight; St. Andrew's, none; Millbay, one; and Mutley, fifty-eight; a total of 266. The unoccupied self-contained tenements at the same date were:—Laira, 105; Vintry, eleven; Greenbank, one; Hoe, seventeen; Compton, seven; Frankfort, fifteen; Sutton, thirty-eight; Friary, sixteen; St. Peter's, two; Charles, four; Drake's, two; St. Andrew's, six; Millbay, eleven; and Mutley, twenty-eight; total, 263. The statement also shows the number of rooms unoccupied in tenements as follows:—Laira, 455; Vintry, forty-four; Greenbank, nine; Hoe, eighty-two; Compton, twenty-eight; Frankfort, thirty-six; Sutton, 166; Friary, ninety-three; St. Peter's, six; Charles, fifty-four; Drake's, four; St. Andrew's, thirty-eight; Millbay, fifty-four; Mutley, 134; total, 1,203.—*Western Mercury.*

DEVONSHIRE MARBLES.—The Phœnix Marble Works (Plymouth) send us some specimens of the Devonshire marbles in which they deal. These are beautifully-marked marbles, and afford a great variety of fine colour, both warm and cool. The "Prince Rock Grey," the "White-veined Black," the "Favoriditæ," and the "Clouded Yellow" are all most effective marbles, and all these can be had in blocks "up to any reasonable length," as the owners put it. Some of the other kinds can only be had in comparatively small sizes, though they may be useful in special situations.

MARKET EXTENSION, NEWTON ABBOT.—On the 21st ult. Mr. F. H. Tulloch, M.Inst.C.E., Local Government Board inspector, held an inquiry at Newton Abbot into the application of the Urban District Council for sanction to borrow 4,140*l.* for covering in a portion of the River Lemon and for other works in connexion therewith. Mr. F. Watts, Clerk to the Council, explained that the Council, finding the business of the markets greatly increasing, and that there was not sufficient accommodation for the numbers of cattle sent in for sale, obtained under a Provisional Order power to borrow 12,000*l.* Of that amount 2,500*l.* had already been raised for buying land to extend the markets; and 4,100*l.* was now applied for to cover over the River Lemon, which at present, with a road, divided the markets from the land purchased for additional market accommodation. In addition to the surveyor's scheme, there was another, prepared by Mr. John Chudleigh, a member of the District Council. The Council at present recommended the surveyor's scheme. If, however, it was thought that Mr. Chudleigh's was the more desirable, it was quite prepared to fall in with that view. A portion of the scheme prepared by the surveyor involved the duplicating of the sewer under the Lemon, the deepening of the river, and the affording of sufficient waterway to prevent damage in case of flooding. It was on this particular point that difference of opinion had arisen. After Mr. Lewis Stevens, Surveyor to the District Council, had given a detailed explanation of his scheme, Mr. J. Chudleigh, architect, said that the surveyor's estimate for covering and deepening the Lemon was 3,500*l.*; he (Mr. Chudleigh) said it could be done quite as effectively for 2,000*l.* In reply to the inspector, Mr. Chudleigh said an increased waterway could be got by building two culverts instead of one, but it would involve much additional expense. He did not want his scheme adopted, but the Council should have called in outside professional advice. The surveyor's scheme was faulty in design and wasteful in details. Other members of the Council having spoken, the Surveyor replied to the criticisms of his scheme, and the inquiry closed.

GLASGOW BUILDING TRADES EXCHANGE, LTD.—A general meeting of the Glasgow Building Trades Exchange, Ltd., was held on the 27th ult. in the News Chambers, Glasgow, Deacon James Goldie presiding. Mr. David Cook, Secretary, read a paper on "The Relations of Proprietor, Architect, and Contractor." Mr. Cook first dealt with the qualifications of an architect and his relation towards the proprietor when preparing plans and when he was supervising the building. He pointed out that, while originally he was only an architect, he afterwards became the agent of the proprietor, and was under the legal conditions which existed between agent and client. Proceeding to deal with special cases, Mr. Cook discussed how far the architect's authority went in his relationship to the builder and the proprietor, and whether, if he exceeded his authority, the builder must suffer or the proprietor. He said if the architect really exceeded his authority the proprietor suffered, but had recourse against the architect. Again, if there was no blame attached to the proprietor, then the builder suffered, but had recourse against the architect. In conclusion, he dwelt upon the amount of supervision an architect was bound to exercise in supervising a work.

BUILDING PLANS, PRESTWICH.—A meeting of the Prestwich Union Guardians was held on the 28th ult. Mr. Joseph Pickvance presided. The General Purposes Committee recommended that Messrs. T. Worthington and Sons, Manchester, be appointed as architects for the new Infirmary to be erected by the Board on the Booth Hall Estate at Blackley. Mr. Lee moved an amendment that the proceedings be referred back for further consideration. He thought that designs ought to be obtained by public competition. The Rev. W. Sassen seconded the amendment. When the Board was going to spend 50,000*l.* or 60,000*l.*, he said, it was only right that something like a competition should take place. Moreover, it would be fair to the architectural profession. Mr. Hulton said that Mr. Jenner Fust, the Local Government Board Inspector, advised them that it would be better to draw lots as to who should be the architect. It was entirely a question of saving time. Mr. Birchenall supported the amendment. In a large undertaking like this he contended that they ought to have competitive designs. For the amendment there were three votes, and all the other members of the Board voted against it. The recommendations of the Committee were adopted.

BELFAST BUILDERS' ASSOCIATION.—On the 26th ult. the annual meeting of the Belfast Builders' Association was held, followed by the annual dinner in the evening. The meeting took place in the offices, 14, Arthur-street, the President, Mr. John Martin, J.P., being in the chair. The Secretary read the annual report of the Committee, which was unanimously agreed to. It stated:—It is unfortunate to again relate that the building trade has in no way improved. Materials continue at high prices, and labour is considerably in excess of demand.—The balance sheet was presented by the Hon. Treasurer, Robert B. Henry, J.P., and showed the finances of the Association to be in a satisfactory state. The election of officers resulted as follows:—President, Mr. John Martin, J.P.; Vice-President, Mr. Robert Corry, J.P.; Hon. Treasurer, Mr. Robert B. Henry, J.P.; Committee, Messrs. W. J. Campbell, J. Courtney, W. H. M'Laughlin, John Smith, S. B. Thompson, James N. M'Cammond, John P. Corry, and W. J. Stewart. The dinner was held at the Grand Central Hotel. In the unavoidable absence of the President, Mr. John Martin, J.P., the chair was taken by Mr. R. B. Henry, J.P. The loyal toast having been honoured, "The Public Boards of Belfast" was proposed by the Chairman. The Corporation had perfected a main drainage scheme, and now, thanks to the advance of science, they were taking steps to

ascertain the best means of treating the sewage. They had at present in hand a new City Hall, which, from all they could see, both as regarded design and the execution of the work, would reflect credit upon both the architect and the builders. — The Lord Mayor responded. Regarding the main drainage, it had received severe criticism, but he thought they would admit that it was utterly impossible to conceive a large scheme in which fault could not be found on one or two points. The question of flooding had received careful consideration on the part of the Improvement Committee, and he believed with the improvements which had been carried out and the other measures that would be taken they would not have a repetition of the flooding which had caused so much damage to property in the city. Of course the low-lying parts would always be liable to flooding when the tide was particularly high. The new City Hall was another sore point, not because of the architect or the builder, but because they had not yet got possession of the building. If there was ever any city in need of such a hall it was certainly Belfast. Their present Town Hall was totally inadequate in accommodation, and perhaps they would doubtless be surprised to hear that if all the aldermen and councillors, numbering sixty, attended the Council Chamber at once there would not be sufficient seats for them.—Mr. John Davidson, J.P., replying on behalf of the Harbour Commissioners, said that the Commissioners, in their desire to bring to the city a share of the Admiralty work, had commenced a new graving dock which, to use an American phrase, would be the largest in the world. It would accommodate the largest vessels made, and so would bring increased trade to their city.—Mr. William Kerr, who responded for the Water Board, said their aim was to procure pure water, and he believed the citizens would be entirely satisfied with the Mourne scheme.—Mr. W. H. M'Laughlin proposed "The Ulster Society of Architects."—Mr. W. J. Gilliland, President of the Ulster Society of Architects, responded. He said that in certain classes of builders the architect was regarded in the light of a schoolmaster who set an uncongenial task which should, if possible, be shirked. The real builder would understand that the most severe architect was his best friend in disguise. In his experience he found that the builders who had been unsuccessful in Belfast were, as a rule, those who had tried surreptitious dodges, and put in work which was of an inferior character. The architect might be called a terror, but he was only a terror to evil-doers. He was glad to observe that in connexion with the designs for the branch libraries, the Library and Technical Committee had appointed Sir Thomas Drew as an assessor to prepare the conditions for the competition.—The health of the guests was proposed by Mr. John Smith, and acknowledged by Mr. J. C. White and Mr. S. C. Hunter. The Lord Mayor asked the guests present to drink the toast of "The Builders' Association," to which the Chairman replied.

Barrow Master Builders' Association.—The members of this Association assembled at the Victoria Park Hotel, Barrow, recently, on the occasion of the annual banquet. Mr. W. Ramsay, the President, was in the chair, and Councillor J. N. Neal occupied the vice-chair. The loyal and patriotic toasts having been honoured, Mr. Saddler, in proposing the toast of the "Borough Surveyor and Architects," said the interests of the master builders were inseparably bound up with those of the architects. On an occasion like that they were inclined to criticise the architects, and endeavour, if possible, to let them see themselves as they were seen by that Association. He did not know that he had the courage to say very much about them that evening, after what had taken place at the last meeting of the Council, when two members of that Association, who were also councillors, made a supreme effort to have the architectural work of the borough again restored to the architects in private practice. They did not succeed, however, and it seemed to him that the Corporation did not understand the question as it was understood by the members of that Association. Work had been slack, and he thought that the offices of the architects might as well be closed up, yet notwithstanding that they had decided to dump into the Corporation offices additional architects to do their work. He thought the Council did not know the capabilities of the local architects. He believed the Borough Surveyor had justified his appointment, and had gained the confidence of the Corporation. Messrs. M. Stables, J. Butler, and E. M. Young suitably responded. Mr. E. M. Young, in the course of his remarks, suggested the desirability of the Corporation having powers to approve of elevations of buildings as well as of sanitary matters, and referred to the custom on the Continent, where, in the main thoroughfares of their cities, all elevations had to be approved by the authorities, and no building could be erected unless it would be an ornament to their cities. Mr. Young also wished it to be understood that in putting up good architectural buildings it did not necessarily follow that these buildings would be costly, for if the architect paid proper attention to the proportion of his building, good detail, and the fitness of things, as well as a proper distribution of material, the effect would be good at a comparatively small cost.—Alderman Barrow, in submitting the toast of the evening, "Success to the Master Builders' Association," said he did not think that the protection craze had been taken up by the Corporation, but there were occasions when it was desirable that they should have a staff, which had been trained to what he conceived to be an extremely difficult profession, that of architect, and which would be able to render to the Corporation some assistance in the supervision of plans that might be submitted to them by private architects. When they wanted to build the Technical Schools there was an open competition amongst the architects. He thought when the time came for school extension in the borough that private architects would have an opportunity of engaging in that work. The great defect of English towns compared with Continental towns was the unfortunate sameness of the buildings. He believed that Association was doing a great amount of good and consolidating the builders into one compact body. — The President, in replying to the toast, said although the Association was only five years old, it was becoming stronger, and the benefits accruing from it were becoming more manifest. Other toasts followed.

Yorkshire Federation of Building Trade Employers.—The members of the Yorkshire Federation of Building Trade Employers visited Hull on the 21st ult. to hold their annual dinner, which took place at Powolny's Restaurant. About 200 members and friends were present. Mr. E. Good presided, and he was supported by the Mayor (Alderman W. Jarman), Sir Alfred Gelder, J.P., the Sheriff (Mr. J. H. Fisher, J.P.), Mr. A. Moulson (of Bradford, Vice-President of the Federation), Alderman Jessop, J. P. (of Huddersfield), Councillor England (of Barnsley), Mr. P. Rhodes (of Leeds), Mr. T. Goates, Mr. P. Gaskell, Mr. J. Watson, Colonel Jacobs, Mr. F. Beilby (President of Hull Branch), Councillor G. L. Scott, J.P. (Vice-President), Mr. T. Marsden, Mr. W. Hoggard (of Bridlington), Councillor Lyons (of Malton), Mr. J. Townsley, Mr. J. A. Brown, Mr. P. Runton, Mr. L. Kitchen, and Mr. G. Stanley (Secretary). The loyal and patriotic toasts having been honoured, Sir Alfred Gelder gave the toast of "The National Association." He said that one of their principal difficulties with local builders was that they did not get on fast enough with their work. They were always being told that the Americans were more expeditious, and he would like to see them wipe out that stigma. The outlook in the building trade at the present time was not of a most prosperous character, but he thought there was a wonderful recuperative power in the English nation.—Alderman Jessop, an ex-Mayor of Huddersfield, and President-Designate of the National Association, responded. He said they had heard a great deal about the Americans and their hustling, but he did not know that England would be much better if they started hustling up their buildings. The buildings put up in America were not half as substantial as the buildings put up in this country.—Councillor England proposed the toast of "The Mayor and Corporation of Hull," and Alderman Jarman, replying, made allusion to the great improvements carried out in the city of late years. The toast of "The City and Trade of Hull" was proposed by Mr. P. Rhodes, of Leeds. Alderman Larard, responding, said he believed the trade of Hull would soon recover from the present slackness. He challenged contradiction when he said that Hull was rapidly becoming, if it had not already become, the best paved city in the United Kingdom. Latterly they had had some discussion with reference to the cost and the way the streets were cleansed in Hull. They must remember that Hull was naturally flat, and that the state of the sub-soil was certainly not conducive to cleanliness, and, therefore, what cleanliness they might have was the result of hard work and attention. In 1890 the Corporation had ninety miles of streets in their scavenging contracts; in 1898 106 miles, and in 1904 114½ miles, so that they had had a large increase in the mileage of the city because the city was growing. In 1890 the Corporation had 194 miles of streets swept per week; in 1898 282 miles; and in 1904 325 miles. — The Sheriff proposed the toast of "The Yorkshire Federation," and said he took it that the Federation was formed for the purpose of protection. The Chairman replied, and said the only object the Federation had in view was equity, in order that they might cope with the difficulties which arose from time to time. Had it not been for the Yorkshire Federation, notwithstanding the unfortunate crisis which took place in Hull five years ago, there would have been many other irruptions in this part of the country. They did not wish to oppose the rights of other people or the rights of the workmen. If they could only adjust the great labour problems, it would augur well not only for the success of the building trade, but for the prosperity of the whole country. Other toasts followed. Prior to the dinner, a meeting of the Federation was held, the President in the chair. Representatives were present from Huddersfield, Bradford, Barnsley, Sheffield, Halifax, Wakefield, Leeds, Scarborough, Bridlington, Selby, Malton, and Hull.

Royal Academy Lectures.—On Monday, the 8th inst., a course of lectures on sculpture will be commenced by a lecture by Mr. W. R. Colton, A.R.A., on "Enthusiasm in the Pursuit of Sculpture." The course will be continued by lectures by Dr. A. S. Murray, the subjects being arranged as follows:—Monday, February 15, "Sarcophagi"; Thursday, February 18, "Athenian Stelæ"; Monday, February 22, "Sculptured Pedestals"; and Thursday, February 25, "The Niobides in Florence." On Monday, February 29, Professor Aitchison will commence a course of four lectures on "Vitruvius," to be continued on Thursday, March 3, Monday, March 7, and Thursday, March 10.

South-Western Building Trades Employers' Federation.—The annual meeting of this Federation was held at the Mitre Hotel, Hereford, on the 21st ult. The chair was taken by Mr. W. P. Lewis (Hereford), the President of the Federation, and amongst those present were Messrs. E. J. Neale, President Bristol Master Builders' Association; F. N. Cowlin, (Cowlin and Sons, Bristol), George Humphreys (Bristol), J. Long (Long and Sons, Bath), E.W. Wooster (Hayward and Wooster, Bath), C. Bryer (Bridgwater), R. Bowers, E. W. Wilks, W. Cooke, William Powell, W. P. Lewis, jun. (Hereford). The Secretary read the annual report, which was approved, and ordered to be printed and circulated amongst the members. The Treasurer (Mr. F. N. Cowlin) made his financial statement, which showed the financial condition of the Federation was very good indeed, and that there was a good balance in hand on the year's working. The following gentlemen were duly appointed for the year:—President, Mr. E. Mudge, Exeter; Vice-Presidents, Mr. E. W. Wooster, Bath, and Mr. W. Dowling, Bristol; Treasurer, Mr. F. N. Cowlin, Bristol; Auditors, Messrs. George Humphreys and E. J. Neale, Bristol. The other business of the meeting being concluded, a hearty vote of thanks was accorded on the proposition of Mr. G. J. Long, and seconded by Mr. F. N. Cowlin, to Mr. W. P. Lewis, the retiring President, for so ably carrying out the duties of that office, and for his great interest in the Federation, which had so considerably added to its success. Mr. Lewis, in reply, expressed his thanks for the resolution, and stated how vital it was to employers to organise so that they might be in a position to resist any undue demands from the Trade Unions.

York Master Builders' and Contractors' Association.—The annual dinner of this Association was held recently at the Old George Hotel, Pavement. Mr. R. Dent, President of the Association, presided, and was supported by Mr. George Sharp (Vice-President), Mr. Councillor Mansfield (ex-President), Mr. James Longden (Sheffield), Mr. E. T. Felgate, Mr. S. Needham, and about fifty members and friends. After the loyal toasts were honoured, Mr. George Moss proposed "The Yorkshire Federation of Building Trades' Employers," and Mr. Councillor Mansfield responded. Mr. James Longden proposed "Success to the York Association," to which the President responded. Mr. George Sharp proposed "The City and Trade of York," and Mr. B. Kilvington responded. The other toasts included "The Architects and Surveyors," proposed by Councillor W. H. Birch, and responded to by Mr. E. T. Felgate, and "The Visitors," proposed by Mr. J. Hardgrave, and responded to by Mr. Holgate.

Improvements.—The Improvements Committee reported as follows at the meeting of the London County Council on Tuesday:—"(1) *Richmond-road*, (3) *Battersea Bridge-road, and* (12) *Tooting High-street*.—The Council, on November 17, 1903, decided not to proceed further with the applications to Parliament in respect of the proposed widenings at Richmond-road, at Battersea Bridge-road, and at Tooting High-street. We have communicated with the several local authorities concerned in the remaining schemes with a view to obtaining their consent to the proposed tramways, and also promises to contribute the amounts suggested by the Council towards the cost of the street widenings, and we now report, for the information of the Council, the present position of each improvement. (2) *Edgware-road, etc.*—The St. Marylebone Metropolitan Borough Council dissented from the construction of the tramway. The Pad-

dington Metropolitan Borough Council has consented to the construction of the tramway, but has declined to contribute any part of the cost of the improvement. The Hampstead Metropolitan Borough Council has also declined to contribute towards the cost of the improvement. The Parliamentary Committee reported on January 26, 1904, that as the necessary consents had not been obtained, the tramway had been dropped. (4) *Wandsworth-common, north side, etc.*—The Battersea Metropolitan Borough Council has consented to the tramway. The Wandsworth Metropolitan Borough Council has consented to the tramway, and has offered, subject to certain conditions, to contribute one-sixth of the cost of the improvement instead of one-third, as required by the Council's resolution. (5) *Streatham High-road.*—The Wandsworth Metropolitan Borough Council objected to the proposed diversion of the tramway along Gleneldon-road, etc., and the Parliamentary Committee reported on January 26, 1904, that the tramway had been dropped. (6) *Malpas-road, etc.*—The Deptford Metropolitan Borough Council has consented to the tramway, and has agreed, subject to certain conditions, to make the necessary contribution. The Lewisham Metropolitan Borough Council has also consented to the tramway, and has agreed to make the necessary contribution. (7) *Lordship-lane.*—The Camberwell and Lewisham Metropolitan Borough Councils have consented to the tramway, and have agreed to make the necessary contributions. (8) *Lewisham High-road, etc.*—The Deptford and Lewisham Metropolitan Borough Councils have consented to the tramway, and have agreed to make the necessary contributions. (9) *Shooter's Hill-road.*—The Greenwich Metropolitan Borough Council has consented to the tramway, but has declined to contribute towards the cost of the improvement. (10) *South-street, etc.*—The Greenwich Metropolitan Borough Council has consented to the tramway, but has declined to make the necessary contribution. The Lewisham Metropolitan Borough Council has consented to the tramway, and has agreed to make the necessary contribution towards the cost of the street widenings in Lewisham. (11) *Basildon-road, etc.*—The Woolwich Metropolitan Borough Council has consented to the tramway, and has agreed to make the necessary contribution."

UNDERGROUND ROOMS IN ST. PANCRAS.—The Public Health Committee of the London County Council reported as follows at Tuesday's meeting of the Council:—"The Council will remember that when inquiry was made in the Metropolitan Borough of St. Pancras by the Medical Officer of Health as to the number of underground rooms illegally occupied as dwellings, it was found that over 400 tenements, affording accommodation for more than 1,000 persons, were occupied separately, although they contravened the provision of the law relating to underground room beginning to be occupied after 1855. As a result of a subsequent inspection of the district, the Borough Medical Officer reported that there were 640 rooms in which the conditions were practically irremediable, and he suggested that these rooms should be dealt with consecutively, and at intervals, 'so as to avoid the serious effects of suddenly displacing a large population.' On December 22 last we reported that the first set of notices, dealing with fifty houses, had been served by the Borough Council on August 7, but pointed out that it was not until December 16 that the question of serving fifty-eight further notices was considered, and we recommended the Council to press the Borough Council to proceed with more rapidity in the matter. The Council adopted our recommendation, and a letter was addressed to the Borough Council expressing the hope that they would give instructions for notices to be served at more frequent intervals so as to secure compliance with the law as soon as reasonably practicable. We are now glad to report that the Borough Council resolved, on January 13, that a further set of notices should be served on the owners of twenty-seven illegally occupied underground rooms, requiring them to discontinue, within four months from the date of the service of the notice, to suffer the rooms to be let or occupied as dwellings contrary to statute. We would, however, again remind the Council that at this rate of progress some years will elapse before these rooms will all have been dealt with."

MEMORIAL STATUE, JARROW.—A statue has been erected in Jarrow to Sir Charles Palmer to commemorate his attainment to his eightieth year. The work consists of a bronze statue of Sir Charles standing on a pedestal, the total height being 26 ft. The sculptor for the work was Mr. Albert T. Toft, whose design was selected in a limited competition, in which Mr. T. Brock acted as assessor. Mr. M. H. Spielmann was retained as technical adviser. The cost of the memorial exceeds 2,000*l.*

APPOINTMENT OF SANITARY OFFICERS.—The Local Government Board has sanctioned the appointment of the undermentioned sanitary inspectors:—Messrs. H. Mettam and T. L. Davies in the City of London, at a salary of 200*l.* per annum each, rising by annual increments of 10*l.* to a maximum salary of 250*l.* Miss F. N. F. Lovibond in Holborn, at a salary of 130*l.* per annum, rising by annual increments of 5*l.* to a maximum salary of 150*l.* Mr. H. King in Lewisham, at a salary of 150*l.* per annum, rising by annual increments of 10*l.* to a maximum salary of 180*l.*

BRISTOL GRAMMAR SCHOOL WAR MEMORIAL.—A memorial has just been completed in Bristol Grammar School in honour of former scholars who took part in the South African war. The memorial takes the form of a brass tablet, mounted on a traceried canopied frame of oak. The work has been carried out by Messrs. Davey and Bushell, sculptors, of St. Michael's Hill.

THE LONDON BUILDING ACT.—At the meeting of Lewisham Borough Council on Wednesday evening the Works and General Purposes Committee reported that they had suggested the following amendments to the London Building Act for the consideration of the Building Act Committee of the London County Council:—

(*a*) That provision should be made for the adjustment of all questions likely to arise between owner, occupier, and ground landlord as regard their respective obligations and liabilities to one another so far as the London Building Act is concerned.

(*b*) That in the case of existing buildings, no hard and fast rule should be laid down, but each building should be dealt with upon its merits according to the circumstances of the case, allowance being made for the character of the construction of existing means of escape and provision for fire extinction.

(*c*) That in all cases under any amendment Bill, the interested parties should be entitled to propose alternative measures, which it shall be the duty of the local authority to consider, with the right in case of disagreement of reference for final decision to a tribunal of appeal to be constituted for the purpose, somewhat similar to that provided for in section 175 of the London Building Act, 1894, or to arbitration.

The report was adopted.

ROYAL ACADEMY.—The following are the dates for sending in works intended for this year's Royal Academy Exhibition:—Water-colours, miniatures, black and white drawings, engravings, etchings, architectural drawings, and all other works under glass—*Friday, March* 25. Oil paintings—*Saturday, March* 26, and *Monday, March* 28. Sculpture—*Tuesday, March* 29. All works must be delivered at the Burlington-gardens entrance.

CAPITAL AND LABOUR.

PLUMBERS' STRIKE, CARDIFF.—During the past few weeks there has been a dispute with the local operative plumbers employed at the Cardiff Municipal Buildings. It appears that a contract was given to a heating engineering firm, and it had come to knowledge that this firm employed others than plumbers to do certain work said to be recognised as plumbers' work. A protest was sent to the firm, and afterwards the plumbers struck work on the new Town Hall and Law Courts. Mr. Lanchester (architect) consented to act as arbitrator in the dispute, and his award stated that Messrs. Ashwell and Nesbitt must, under their contract dated October 30, 1901, employ plumbers for the hot-water services, except in the case of such parts of the work as involved the use of the type of joints known as D. M. Nesbitt's patent joint; and that the stamp duty on the award be paid in equal shares by the two parties. The plumbers have accepted the award, under a protest in regard to the point which mentions D. M. Nesbitt's patent joint, and work has been resumed.—*Western Mail.*

Legal.

DISPUTE AS TO A BUILDING LINE.

MR. JUSTICE BUCKLEY, in the Chancery Division last week, heard the case of the Whitley and Monkseaton Urban District Council *v.* Mulholland, an action by the plaintiffs, the Urban Sanitary Authority of Whitley, Northumberland, against the defendant, Mr. John Mulholland, of Whitley Bay, to restrain him from erecting a building which would, it was said, encroach on the building line prescribed by the plaintiffs under the Public Health Act, 1875. The plaintiffs also asked for an order directing the defendant to pull down the portion already erected.

It appeared that the defendant was the owner of No. 1, Esplanade, and the old Post Office building in Whitley, and he decided to pull down the old buildings on the site and put up a hotel. The west front of the old buildings was towards the Esplanade, and the south frontage towards the Whitley-road. The plaintiffs, in 1903, applied to the Local Government Board for a provisional order to authorise them to widen Whitley-road, and for this purpose to acquire lands on the north side of the road. Plaintiffs did not seek to obtain powers over defendant's property, as they said they intended to rely on sections 154 and 155 of the Public Health Act, 1875, and so prescribe the line of frontage of any buildings to be erected. Plaintiffs accordingly entered into negotiations with the defendant to alter his line of frontage, and to widen the roadway by taking a portion of his land. Plaintiffs, on April 25, 1903, under section 155 of the Act, prescribed the building line running from a point set back 1 ft. 10 in. from the Esplanade, Whitley-road corner, to a point brought forward 4½ in. at the other corner. The plaintiffs further alleged that on the same date they entered into an agreement with the defendant as to this, and also as to the widening of the land taken over and the amount of compensation to be given. Subsequently, finding that the defendant had commenced a building in contravention of these terms, and nearer to the centre of the road, the present action was commenced.

The defendant's case was that in July, 1901, he obtained the plaintiffs' approval to alter part of his buildings, and in 1903 a new line of frontage was marked on a plan prepared by plaintiffs when they were proposing to widen the road and the inquiry was being held by the Local Government Board Commissioners. Defendant's case was that at this time his architect pointed out that the building then in course of erection would exceed the limit. A correspondence took place between the defendant's architect and the plaintiffs' surveyor, and in February the plaintiffs wrote suggesting that defendant should make certain alterations in the original plans, and on March 12 the defendant wrote asking that the new line should be marked on plans. Getting no reply, defendant completed his building. Defendant admitted making a verbal agreement on April 25 with plaintiffs to set back his building, etc., on certain conditions, and this agreement the defendant counterclaimed to set aside on the ground of common mistake.

In the result the parties arrived at a compromise. It was agreed that the building which the defendant was erecting, as it stood, with doors and windows, should remain, and be approved by the plaintiff council, the parties agreeing to an order that a plot of garden land on the Esplanade, in front of the land in question, should be thrown open, and for ever remain an open space. The plaintiffs further agreed to pay the defendant 160*l.* as compensation, each side paying its own costs.

Mr. Buckmaster, K.C., and Mr. R. C. Glen appeared for the plaintiffs; and Mr. Astbury, K.C., and Mr. W. H. Cozens-Hardy for the defendant.

PATENTS OF THE WEEK.

APPLICATIONS PUBLISHED.*

174 of 1903.—J. RICHMOND and R. F. CAREY: *Appliances for Electrically Controlling Lifts, Hoists, and the like.*

Appliances for electrically controlling lifts, hoists, and the like, consisting in the employment of a motor controlled by a pilot switch, and driving a worm and worm-wheel operating one half of a magnetic clutch in connexion with another half magnetic clutch mounted on the spindle of a main reversing switch and rheostat; the return of the main switch and rheostat, when the pilot switch is operated to stop the working, being effected by a weighted lever attached to a chain or cord, which is fastened at its middle to a wheel, so that said lever will drop suddenly and stop at its lowest position without recoil.

507 of 1903.—R. D. WADDELL: *Ventilators.*

Ventilators which comprise an outlet pipe from the compartment to be ventilated, a trumpet mouth carried by the pipe and arranged to face a current of air and a shield, so arranged within the said trumpet mouth that a space is left between them, while at the same time the edge of the shield projects beyond the rim of the trumpet mouth.

2782 of 1903.—T. CHARTERIS: *Wood Block Flooring.*

This consists in constructing wood blocks for flooring with a dovetail or rabbet, or both, at or near the bottom edges either at the sides or at both sides and ends, and affixing at the ends a metal plate which projects and engages the rabbet or dovetail on one side or end of a neighbouring block to ensure a perfect fixing of the blocks to one another.

2953 of 1903.—T. CHARTERIS: *Wood Block Flooring.*

A wood block flooring which consists in constructing the border blocks from three pieces of wood having an elastic medium between them, the whole being bolted together so as to allow of contraction and expansion of the blocks.

*All these applications are in the stage in which opposition to the grant of Patents upon them can be made.

4844 of 1903.—F. B. RENDLE: *Means for Glazing Roofs and Structures.*

This consists in the combination of a bearing for the side edges of the sheets of glass to rest on, having a central rib projecting outwards between the sheets of glass, and a head along its outer edge with lips holding on to this head, having projecting stems to pass through the cap to receive nuts or other fastenings to hold down the cap.

4853 of 1903.—J. BOTTERILL: *A Safety Appliance for the Openings or Doorways of Hoists.*

A safety appliance for the openings or doorways of hoists wherin flexible sheeting with transversely arranged bars or rods are secured thereto, the ends of which, or some of which, project beyond the edges of the sheeting and work in guides parallel to the hoist well, is connected to the cage at its top and bottom walls in such wise that the sheeting is caused to close always the opening or doorway of the hoist well, except when the cage is opposite thereto.

4859 of 1903.—A. SCHNEIDER: *Latches or Door Fastenings.*

The subject of the present invention is a bearing for the spindles of latches or door fastenings, which, by rigidly connecting together the two sleeves forming the bearing for the spindle, prevents the handles or knobs of the fastening and the spindle becoming loose, even after it has been some time in use and the door has become warped by drying or from other causes. According to the invention, the sleeves through which the spindle is passed are rigidly connected together by a bow or bent piece. In the free space enclosed by this bow, between the two bearing sleeves is situated the latch or lock, so that the bow embraces the same. The holes in the casing of the door fastening for the spindle are in line with the sleeves.

4978 of 1903.—G. PETERS: *Turf Bricks.*

This relates to the manufacture of turf bricks, and more especially to a process of preparing the turf before bringing it into the brick press. The invention consists in piling up the fresh turf (the water of which may be allowed to pass off in consequence of the weight of the turf) into heaps of about 30 ft. in height, after first reducing the turf into fibres or small pieces. The turf piled up in this way begins to get hot from within the heap, most probably in consequence of processes of oxydation. The quantity of water contained in the turf is, by the heating of the turf, sufficiently reduced to allow the turf to be pressed into bricks. The process has the further advantage that the structure of the bricks manufactured from the turf, treated as above, is more uniform on account of the fibre of the turf becoming much softer by the rotting process taking place. It has been found that neutral turfs, as well as acid turfs, undergo the self-heating process. In case the turf contains too much acid, neutralising means as lye, chalk, or the like, may be added.

7255 of 1903.—J. and M. CRAIG, LTD., and R. HIGHET: *Die Presses for the Manufacture of Tiles.*

A die press for the manufacture of tiles having undercut or dovetail grooves or recesses, consisting in the combination with the bottom die or plunger of spring actuated blocks, whose upper ends project through the die and constitute tongue pieces to form the recesses in the tiles, and whose lower ends project from the ends or sides of the die so as to be acted on by the die box.

22,620 of 1903.—W. INGLIS: *Fixing of Door Handles to their Spindles.*

Under this invention the one handle is secured to the spindle in the usual manner, but the other handle is secured by means of a rack or toothed arrangement on the spindle, which engages with a spring catch fastened to the knob. The spring catch may be so arranged that it automatically grips the rack of the spindle and can be disengaged by pressing on its end which projects out of a hole in the neck of the knob. In order to prevent the socket of the handle wearing, it may be lined with a thin strip of steel, which is held in place by means of a pin.

24,196 of 1903.—H. SPENGLER: *Adjustable Upright for Shoring up Concrete Ceilings and the Supports therefor.*

An adjustable upright for shoring up the supports and bays of concrete ceilings, characterised by the fact that a corbel, adjustable in the manner known, upon an upwardly adjustable shaft, which carries rods, provided with borings or notches upon the plank lining holders, carrying the longitudinally adjustable rods, can be adjusted at various heights and at different distances apart from each other.

24,266 of 1903.—C. PRANGEMIER: *Doors for Chimneys.*

A means for closing the cleaning openings of chimneys towards the interior of buildings or inhabited rooms, comprising in combination a brick of cement, concrete, or clay, containing a step-wise reduced opening; a metal frame secured in the external step of the brick opening; a slide door, movable in guide grooves of the aforesaid frame; a pair of doors connected together by ties turnable in hinges on the frame, said doors adapted to press against the inner steps of the brick opening, and a spring on the door.

24,494 of 1903.—L. M. D. PELLEGRIN and E. P. PETIT: *Construction of Rotatable Houses or other Buildings.*

A rotatable building, consisting in the arrangement in the basement of a fixed conical, vertical, and central part, provided with rings carrying branches, said rings being adapted to rotate on said part, and the branches being suitably connected to channels for distributing various fluids, such as water, gas, and electricity into the building, and discharging at their lower ends into annular channels, into which discharge other longitudinal channels, the evacuation of waste water or sewage being accomplished through the centre of said central part.

25,964 of 1903.—E. PETZHOLTZ: *Hollow Artificial Stones for Building Purposes.*

The process of manufacturing hollow artificial stones, consisting in immersing a collapsible frame corresponding in section to that of the stone desired in the liquid mass of material of which the stone is to be made, withdrawing it, and, after the adhering layer of material is dried, removing it from the latter.

26,356 of 1903.—E. J. DUMVILLE: *A Fire Escape.*

A fire escape comprising a transportable body having sockets and bolts or rods arranged around said sockets; removable poles adapted to be fitted in said sockets when required, and having plates which are adapted to fit over said bolts when the poles are in place, the upper ends of the bolts carrying pulleys, and a sheet or platform arranged to work up and down between the poles, being manipulated by ropes or chains passing over the pulleys at the top ends of the poles.

26,478 of 1903.—C. REINKE: *Artificial Stone.*

Artificial stone composed of four parts of permian limestone, one part of cement, and a suitable, but small, quantity of oxide of magnesium, intimately mixed under addition of the required quantity of water.

26,792 of 1903.—J. H. WILSON: *Electric Sanitary Closets.*

This consists in the combination in a sanitary closet of a bowl, an electric circuit, means for closing said circuit, for example, by the weight of a person using said closet, and a burner arranged in said circuit and forming the pan of said closet, together with a suitable receptacle in which said burner is pivoted, means for discharging the contents of said burner, and a removable drawer in said receptacle below said burner to receive matters discharged from the said burner.

4353 of 1903.—J. KULHANEK: *Construction of Walls and the like.*

A method of wall construction, characterised by the fact that the wall is formed of thin material, such as plates or slabs, which are set in a lattice work, consisting of a system of parallel wires and a system of parallel flat iron bars threaded upon the wires through suitable holes provided for that purpose, and running at right angles to the wires, the said bars being adapted to be freely displaced upon the wires until the courses of slabs, or the like, are laid.

SOME RECENT SALES OF PROPERTY:

ESTATE EXCHANGE REPORT.

January 25.—By FULLER, MOON, & FULLER.

Croydon.—Tamworth-rd., f.g.r. 20*l.*, reversion in 58 yrs	£400
St. James's-rd., f.g. rents 44*l.* 2s., reversion in 53 yrs.	1,000
Kenley, Surrey.—Ethel Cottages, &c., f.g.r. 50*l.*, reversion in 90 yrs.	1,125
Tottenham.—Stonebridge-rd., f.g. rents 75*l.*, reversion in 84 yrs.	1,625

January 26.—By CHANCELLOR & SONS.

Fulham.—284, Fulham-rd. (s.), u.t. 59 yrs., g.r. 15*l.*, y.r. 120*l.*	1,610
Twickenham.—Heath-rd., "Grove House" and "Laurel Lodge," area 6 a. 3 r. 7 p., f., p.	8,000
Heath-rd., a freehold building site, 1 a. 3 r. 7 p.	1,480

By EDWARD SIMPSON.

Dulwich.—246, 248, and 250, Underhill-rd., f., w.r. 109*l.* 4s.	1,065
Rotherhithe.—16 and 18, Rotherhithe New-rd., u.t. 44 yrs., g.r. 7*l.* 10s., w.r. 70*l.* 4s.	485

By WALTER VINCENT.

Sydenham.—5, Venner-rd., u.t. 95 yrs., g.r. 10., e.r. 40*l.*	235

By FREDK. WARMAN.

Strand.—10, Buckingham-st. (offices), f., e.r. 150*l.*	3,500
Highbury.—15, Balfour-rd., u.t. 46 yrs., g.r. 6*l.* 6s., y.r. 50*l.*	475
59, 61, and 87, Balfour-rd., u.t. 46 yrs., g.r. 18*l.* 18s., y.r. 132*l.*	1,250
Clapton.—31, 32, 35, and 36, Winslade-rd., u.t. 41 yrs., g.r. 8*l.*, w.r. 106*l.* 12s.	590

By ELEY & SHARP (at Boston).

Boston, Lincs.—Wide Bargate, &c., two freehold shops and houses; also a warehouse, area 860 yds., f., p.	3,750

January 27.—By ARTHUR BARTON.

Walworth.—149 and 151, Westmoreland-rd., u.t. 48 yrs., g.r. 10*l.*, w.r. 70*l.* 4s.	550
22, 23, and 24, Sedan-st., u.t. 46 yrs., g.r. 12*l.*, w.r. 96*l.* 4s.	685

By BRADSHAW, BROWN, & CO.

Poplar.—57, West India Dock-rd. (s.), f., e.r. 45*l.*	480
Belvedere, Kent.—Picardy Manor Way, freehold manufacturing premises, area 1 a. 0 r. 16 p., f., p.	265

By LINNETT & LANE.

Kentish Town.—46, Marsden-st., u.t. 36 yrs., g.r. 11*l.*, w.r. 41*l.* 12s.	175
Camden Town.—34, Prebend-st., u.t. 16 yrs., g.r. 12*l.*, y.r. 30*l.*	113

By STOCKER & ROBERTS.

Forest Hill.—48 and 50, Kilmorie-rd., f., y.r. 68*l.*	975

By R. TIDEY & SON.

Kentish Town.—98, Marsden-st., u.t. 46 yrs., g.r. 5*l.*, y.r. 34*l.*	250

By BROWETT & TAYLOR.

Herne Hill.—6, Half Moon-la., u.t. 93½ yrs., g.r. 10*l.*, y.r. 50*l.* (including mortgage)	440
10, Beckwith-rd., u.t. 93½ yrs., g.r. 10*l.*, y.r. 48*l.* (including mortgage)	420
9, 11, 17, 18, and 20, Elmwood-rd., u.t. 93½ yrs., g.r. 47*l.*, y.r. 228*l.* (including mortgages)	2,000
21, Wyneham-rd., u.t. 93½ yrs., g.r. 8*l.* 10s., y.r. 40*l.* (including mortgage)	310
Teddington.—Cedar-rd., "Oakleigh," "Ashville," "Boxmoor," and "Elmfield," u.t. 91 yrs., gr. 18*l.*, y.r. 106*l.*	1,150

By WYATT & SON (at Chichester).

Aldingbourne, Sussex. — Aldingbourne Mill, Bakery, House, etc., area 4 a. 0 r. 5 p., f., p.	900

January 28.—By NEWBON, EDWARDS, & SHEPHARD.

Soho.—2, Portland-st., f., y.r. 65*l.*	1,350
Islington.—5 and 7, Hanover-st., f., y.r. 76*l.*	1,245
Barnsbury.—62 to 78 (even), Copenhagen-st.; also cab yard in rear, f., e.r. 400*l.*	5,170
1 and 2, Francis-st., f., e.r. 60*l.*; also "George the Fourth Tavern," f.g.r. 80*l.*, reversion in 51 yrs.	2,550
3 to 8 Francis-st., f., e.r. 205*l.*	2,825
21, 23, and 25, Pulteney-st., and 9 to 12, Francis-st., f., e.r. 200*l*	2,360
27 to 49 (odd), Pulteney-st.; also "Broughton Cottage," f., e.r. 400*l.*	5,360

By VARLEY & LOCKING.

Kingsland.—65, Alvington-cres., u.t. 62 yrs., g.r. 7*l.*, e.r. 48*l.*	360
Bethnal Green.—15, Quilter-st., u.t. 18¼ yrs., g.r. 4*l.* 10s., w.r. 39*l.*	130
Kentish Town.—35, Torbay-st., u.t. 33½ yrs., g.r. 5*l.*, y.r. 27*l.*	210

By WYER, ADAMS, & GLOVER, with HARLAND & SON (at High Barnet).

High Barnet, Herts.—Marriott-rd., "Parkhurst," u.t. 82½ yrs., g.r. 8*l.*, y.r. 40*l.*	475

By NEWELL & HAMLYN (at New Cross).

New Cross.—48 and 50, Kerry-rd., u.t. 58 yrs., g.r. 8*l.* 5s., w.r. 57*l.* 4s.	435
Deptford.—16, Alverton-st., u.t. 40 yrs., g.r. 2*l.* 2s., w.r. 29*l.* 18s.	255
30, 32, and 34, Addey-st., u.t. 21 yrs., g.r. 4*l.*, w.r. 40*l.* 19s.	135
Greenwich.—2 to 26 (even), Caradoc-st., u.t. 5½ yrs., g.r. 35*l.*, w.r. 249*l.* 12s.	110
6, Thornham-st., u.t. 39½ yrs., g.r. 1*l.* 10s., w.r. 22*l.* 10s.	180
3 and 11, Woodland-gr., u.t. 34½ yrs., g.r. 3*l.* 16s. 3d., w.r. 35*l.* 2s.	160
3 and 4, Morden-gr., u.t. 40½ yrs., g.r. 9*l.* 11s., q.r. 52*l.*	130
126, Greenwich-rd., u.t. 39½ yrs., g.r. 7*l.*, q.r. 45*l.*	335
New Charlton.—117 and 119, East-st. (s.), u.t. 41 yrs., g.r. 8*l.*, q.r. 53*l.*	260

January 29.—C. RAWLEY CROSS & CO.

Shepherd's Bush.—88, St. Stephen's-av., u.t. 71½ yrs., g.r. 5*l.* 5s., e.r. 42*l.*	400
Surbiton.—83 and 84, Cleaveland-rd., with laundry premises in rear, u.t. 61 yrs., g.r. 8*l.*, y.r. 66*l.*	550

By LEOPOLD FARMER & SONS.

New Cross.—47, St. Donnett's-rd., u.t. 60½ yrs., g.r. 4*l.* 10s., y.r. 38*l.*	410

By W. B. HALLETT.

Dalston.—20, 32, and 34, Buckingham-rd., u.t. 69 yrs., g.r. 27*l.* 5s., y.r. 94*l.* 4s.	740

By TYSER, GREENWOOD, & CRIER.

Hounslow, Middx.—1, 2, and 3, Clifton Villas, f., w.r. 70*l.* 4s.	775
1, Albert Villas (s.), area ½ acre, f., y.r. 24*l.*	495

By WAGSTAFF & SONS.

Wood Green.—122, Lordship-la., f., e.r. 70*l.*	1,000
Hackney.—82 and 84, Devonshire-rd., u.t. 43½ yrs., g.r. 10*l.*, y.r. 64*l.*	555

Contractions used in these lists.—F.g.r. for freehold ground-rent; l.g.r. or leasehold ground-rent; i.g.r. for improved ground-rent; g.r. for ground-rent; r. for rent; f. for freehold; c. for copyhold; l. for leasehold; p. for possession; e.r. for estimated rental; w.r. for weekly rental; q.r. for quarterly rental; y.r. for yearly rental; u.t. for unexpired term; p.a. for per annum; yrs. for years; la. for lane; st. for street; rd. for road; sq. for square; pl. for place; ter. for terrace; cres. for crescent; av. for avenue; gdns. for gardens; yd. for yard; gr. for grove; b.h. for beer-house; p.h. for public-house; o. for offices; s. for shops; ct. for court.

PUBLISHER'S NOTICES.

Nat. Tel., 6112, Gerrard. Telegrams, "The Builder, London."

THE INDEX (with TITLE-PAGE) for VOLUME LXXXV. (July to December, 1903) was given as a supplement with issue of January 9 last.

CLOTH CASES for Binding the Numbers are now ready price 2s. 6d. each; also

READING CASES (Cloth), with Strings, price 9d. each.

THE EIGHTY-FIFTH VOLUME of "The Builder" (bound), price Twelve Shillings and Sixpence.

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PREPAYMENT IS ABSOLUTELY NECESSARY.

*** Stamps *must not* be sent, but all sums should be remitted by Postal Orders, payable to J. MORGAN, and addressed to the Publisher of "THE BUILDER," Catherine Street, W.C.

Advertisements for the current week's issue are received up to THREE o'clock p.m. on THURSDAY, but "Classification" is impossible in the case of any which may reach the Office after HALF-PAST ONE p.m. on that day. Those intended for the Outside Wrapper should be in by TWELVE noon on WEDNESDAY.

ALTERATIONS IN STANDING ADVERTISEMENTS or ORDERS TO DISCONTINUE same must reach the Office before TEN o'clock on WEDNESDAY MORNING.

The Publisher cannot be responsible for DRAWINGS, TESTIMONIALS, &c., left at the Office in reply to advertisements, and strongly recommends that of the latter COPIES ONLY should be sent.

PERSONS advertising in "THE BUILDER" may have *Replies addressed to the Office*, Catherine Street, Covent Garden, W.C., *free of charge*. Letters will be forwarded if addressed envelopes are sent, together with sufficient stamps to cover the postage. Unused stamps are returned to advertisers the week after publication.

AN EDITION Printed on THIN PAPER, for FOREIGN and COLONIAL CIRCULATION, is issued every week.

READING CASES { NINEPENCE EACH. By post (carefully packed) 1s.

MEETINGS.

FRIDAY, FEBRUARY 5.

Architectural Association.—Mr. W. A. Harvey on "Cottage Homes." 7.30 p.m.

Sanitary Institute (*Lectures for Sanitary Officers*).—Dr. E. J. Steegmann on "Elementary Chemistry," I. 7 p.m.

Junior Institution of Engineers (*Westminster Palace Hotel*).—Mr. Hal Williams on "Producer Gas for Factory, Cold Stores, and Freezing Works." 8 p.m.

SATURDAY, FEBRUARY 6.

Sanitary Inspectors' Association.—Twenty-first Annual Dinner, Venetian Chamber, Holborn Restaurant. 6.30 p.m.

Sanitary Institute (*Demonstrations for Sanitary Officers*).—Inspection at Charing Cross Hospital New Buildings. 2.15 p.m.

Incorporated British Institute of Certified Carpenters.—Monthly meeting, Carpenters' Hall. Mr. W. Middleton will open a discussion upon "Failures in Carpentry and Joinery." 6 p.m.

Architectural Association.—Second spring visit, to No. 11, Hill-street, Berkeley-square, and No. 9, Hyde Park-terrace, W.

MONDAY, FEBRUARY 8.

Surveyors' Institution.—Discussion will be resumed on the paper by Mr. Ralph Neville, K.C., entitled "The Garden City Scheme and First Garden City, Limited." 8 p.m.

Institution of Mechanical Engineers (*Graduates' Meeting*).—Mr. W. H. Merrett on "The Work of the Alloys Research Committee," illustrated.

Sanitary Institute (*Lectures for Sanitary Officers*).—Dr. E. J. Steegmann on "Elementary Chemistry," II. 7 p.m.

Regent-street Polytechnic (*University Extension Lectures*).—Prof. Vivian B. Lewes on "The Chemistry of Air, Fire, and Water," II. 8 p.m.

Glasgow Philosophical Society (*Architectural Section*).—Mr. J. Maurice Arthur on "Legal Points Relative to Buildings." 8 p.m.

TUESDAY, FEBRUARY 9.

Institute of Sanitary Engineers, Ltd. (*Lectures in Practical Sanitary Science*).—Dr. J. Priestley, B.A., on "Sanitary Law," I. 7 p.m.

Institution of Civil Engineers.—Mr. H. H. West on "Tonnage Laws, and the Assessment of Harbour Dues and Charges." 8 p.m.

WEDNESDAY, FEBRUARY 10.

Sanitary Institute.—Discussion on "Road Sanitation," to be opened by Mr. J. Patten Barber, M.Inst.C.E. (Borough Engineer and Surveyor, Islington), and Dr. Louis C. Parkes, M.D., D.P.H. (Medical Officer of Health, Chelsea, Consulting Sanitary Adviser to H.M. Office of Works). The chair will be taken at 8 p.m. by Lord Monkswell, Chairman of the London County Council.

Society of Arts.—Mr. C. Vernon Boys, F.R.S., on "Thermit: Its Application to Metallurgical Engineering." 8 p.m.

Northern Architectural Association.—Mr. W. H. Wood on "Fifteenth Century Architecture." 7.30 p.m.

Edinburgh Architectural Association (*Associates' Paper*).—Mr. C. Mackie, A.R.S.A., on "Common Sense in Art." 8 p.m.

THURSDAY, FEBRUARY 11.

Sanitary Institute (*Lectures for Sanitary Officers*).—Dr. J. Priestley, B.A., on "Sanitary Law," I. 7 p.m.

Leeds and Yorkshire Architectural Society.—Papers: "Registration as Affecting Architecture and Architects," by Prof. Beresford Pite and Mr. W. H. Seth-Smith. 6.30 p.m.

Institution of Electrical Engineers.—Prof. R. M. Walmsley, D.Sc., on "Transatlantic Engineering Schools and Engineering." 8 p.m.

FRIDAY, FEBRUARY 12.

Royal Institution.—Very Rev. J. A. Robinson, Dean of Westminster, on "Westminster Abbey in the Early Part of the Seventeenth Century." 9 p.m.

Sanitary Institute (*Lectures for Sanitary Officers*).—Dr. J. Priestley, B.A., on "Sanitary Law," II. 7 p.m.

Glasgow Architectural Craftsmen's Society.—Mr. J. Jeffrey Waddell on "City Architecture." 8 p.m.

Institution of Civil Engineers (*Students' Meeting*).—Mr. T. S. Nash on "The Electricity and Destructor Station at Plumstead." 8 p.m.

PRICES CURRENT OF MATERIALS.

*** Our aim in this list is to give, as far as possible, the *average* prices of materials, not necessarily the lowest. Quality and quantity obviously affect prices—a fact which should be remembered by those who make use of this information.

BRICKS, &c.

	£	s.	d.		
Hard Stocks	1	16	0	per 1000	alongside, in river.
Rough Stocks and Grizzles	1	13	0	,,	,, ,,
Facing Stocks	2	12	0	,,	,, ,,
Shippers	2	10	0	,,	,, ,,
Flettons	1	10	0	,,	at railway depôt
Red wire Cuts	1	13	0	,,	,, ,,
Best Fareham Red	3	12	0	,,	,, ,,
Best Red Pressed Ruabon Facing	5	0	0	,,	,, ,,
Best Blue Pressed Staffordshire	4	4	0	,,	,, ,,
Do. Bullnose	4	10	0	,,	,, ,,
Best Stourbridge Fire Bricks	4	8	0	,,	,, ,,
GLAZED BRICKS.					
Best White and Ivory Glazed Stretchers	13	0	0	,,	,, ,,
Headers	12	0	0	,,	,, ,,
Quoins, Bullnose, and Flats	17	0	0	,,	,, ,,
Double Stretchers	19	0	0	,,	,, ,,
Double Headers	16	0	0	,,	,, ,,
One Side and two Ends	19	0	0	,,	,, ,,
Two Sides and one End	20	0	0	,,	,, ,,
Splays, Chamfered, Squints	20	0	0	,,	,, ,,
Best Dipped Salt Glazed Stretchers and Headers	12	0	0	,,	,, ,,
Quoins, Bullnose, and Flats	14	0	0	,,	,, ,,
Double Stretchers	15	0	0	,,	,, ,,
Double Headers	14	0	0	,,	,, ,,
One Side and two Ends	15	0	0	,,	,, ,,
Two Sides and one End	15	0	0	,,	,, ,,
Splays, Chamfered, Squints	14	0	0	,,	,, ,,
Second Quality White and Dipped Salt Glazed	2	0	0	,,	less than best.

	s.	d.	
Thames and Pit Sand	7	3	per yard, delivered.
Thames Ballast	6	0	,, ,,
Best Portland Cement	29	0	per ton, ,,
Best Ground Blue Lias Lime	20	6	,, ,,

NOTE.—The cement or lime is exclusive of the ordinary charge for sacks.

Grey Stone Lime ..... 11s. 6d. per yard, delivered.
Stourbridge Fire Clay in sacks 27s. 6d. per ton at rly. dpt.

STONE.

	s.	d.	
BATH STONE—delivered on road waggons, Paddington depôt	1	6½	per ft. cube.
Do. do. delivered on road waggons, Nine Elms depôt	1	8½	,, ,,
PORTLAND STONE (20 ft. average)—			
Brown Whitbed, delivered on road waggons, Paddington depôt, Nine Elms depôt, or Pimlico Wharf	2	1	,, ,,
White Basebed, delivered on road waggons, Paddington depôt, Nine Elms depôt, or Pimlico Wharf	2	2½	,, ,,

	s.	d.	
Ancaster in blocks	1	11	per ft. cube, deld. rly. depôt.
Beer in blocks	1	6	,, ,,
Greenshill ,,	1	10	,, ,,
Darley Dale in blocks	2	4	,, ,,
Red Corsehill ,,	2	5	,, ,,
Closeburn Red Freestone	2	0	,, ,,
Red Mansfield ,,	2	4	,, ,,

YORK STONE—*Robin Hood Quality.*

	s.	d.	
Scappled random blocks	2	10	per ft. cube, deld. r y. depôt.
6 in. sawn two sides landings to sizes (under 40 ft. super.)	2	3	per foot super. ,,
6 in. rubbed two sides ditto, ditto	2	6	,, ,,
3 in. sawn two sides slabs (random sizes)	0	11½	,, ,,
2 in. to 2½ in. sawn one side slabs (random sizes)	0	7½	,, ,,

STONE—(*continued*)—

YORK STONE.—*Robin Hood Quality*—(*continued*)—

1½ in. to 2 in. ditto, ditto	0	6	,,	,,
HARD YORK—				
Scappled random blocks	3	0	per ft. cube	,,
6 in. sawn two sides, landings to sizes (under 40 ft. super.)	2	8	per ft. super.	,,
6 in. rubbed two sides Ditto	3	0	,,	,,
3 in. sawn two sides slabs (random sizes)	1	2	,,	,,
2 in. self-faced random flags	0	5	,,	,,
Hopton Wood (Hard Bed) in blocks	2	3	per ft. cube.	
,, 6 in. sawn both sides landings	2	7	deld. rly. depôt. per ft. super. deld. rly. depot.	
,, 3 in do.	1	2½	,, ,,	

SLATES.

in.	in.	£	s.	d.	
20 × 10	best blue Bangor	13	2	6	per 1000 of 1200 at r. d.
20 × 12	,, ,,	13	17	6	,, ,,
20 × 10	best seconds ,,	12	15	0	,, ,,
20 × 12	,, ,, ,,	13	10	0	,, ,,
16 × 8	best ,, ,,	7	0	0	,,
20 × 10	best blue Portmadoc	12	12	6	,, ,,
16 × 8	best blue Portmadoc	6	12	6	,, ,,
20 × 10	best Eureka unfading green	15	2	6	,, ,,
20 × 12	best Eureka unfading green	17	2	6	,, ,,
18 × 10	,, ,,	12	10	0	,, ,,
16 × 8	,, ,,	10	5	0	,, ,,
20 × 10	permanent green	11	10	0	,, ,,
18 × 10	,, ,,	9	10	0	,, ,,
16 × 8	,, ,,	6	10	0	,, ,,

TILES.

	s.	d.	
Best plain red roofing tiles	42	0	per 1000 at rly. depot.
Hip and Valley tiles	3	7	per doz. ,, ,,
Best Broseley tiles	50	0	per 1000 ,, ,,
Do. Ornamental tiles	52	6	,, ,, ,,
Hip and Valley tiles	4	0	per doz. ,, ,,
Best Ruabon red, brown or brindled do. (Edwards)	57	6	per 1000 ,, ,,
Do. Ornamental do.	60	0	,, ,, ,,
Hip tiles	4	0	per doz. ,, ,,
Valley tiles	3	0	,, ,, ,,
Best Red or Mottled Staffordshire do. (Peakes)	51	9	per 1000 ,, ,,
Do. Ornamental do.	54	6	,, ,, ,,
Hip tiles	4	1	per doz. ,, ,,
Valley tiles	3	8	,, ,, ,,
Best "Rosemary" brand plain tiles	48	0	per 1000 ,, ,,
Best Ornamental tiles	50	0	,, ,, ,,
Hip tiles	4	0	per doz. ,, ,,
Valley tiles	3	8	,, ,, ,,
Best "Hartshill" brand plain tiles, sand faced.	50	0	per 1000 ,, ,,
Do. pressed	47	6	,, ,, ,,
Do. ornamental, do.	50	0	,, ,, ,,
Hip tiles	4	0	per doz. ,, ,,
Valley tiles	3	6	,, ,, ,,

WOOD.

	At per standard. £	s.	d.	£	s.	d.
Deals: best 3 in. by 11 in. and 4 in. by 9 in. and 11 in.	15	10	0	16	10	0
Deals: best 3 by 9	14	10	0	15	10	0
Battens: best 2½ in. by 7 in. and 8 in., and 3 in. by 7 in. and 8 in.	11	10	0	12	10	0
Battens: best 2½ by 6 and 3 by 6	0	10	0	less than 7 in. and 8 in.		
Deals: seconds	1	0	0	less than best		
Battens: seconds	0	10	0	,, ,,		
2 in. by 4 in. and 2 in by 6 in.	9	0	0	9	10	0
2 in. by 4½ in. and 2 in. by 5 in.	8	10	0	9	10	0
Foreign Sawn Boards— 1 in. and 1½ in. by 7 in.	0	10	0	more than battens.		
¾ in.	1	0	0	,,		
Fir timber: best middling Danzig or Memel (average specification)	At per load of 50 ft. 4	10	0	5	0	0
Seconds	4	5	0	4	10	0
Small timber (8 in. to 10 in.)	3	12	6	3	15	0
Small timber (6 in. to 8 in.)	3	0	0	3	10	0
Swedish balks	2	15	0	3	0	0
Pitch-pine timber (30 ft. average)	3	5	0	3	15	0

JOINERS' WOOD.

	At per standard. £	s.	d.	£	s.	d.
White Sea: first yellow deals, 3 in. by 11 in.	23	0	0	24	0	0
3 in. by 9 in.	21	0	0	22	10	0
Battens, 2½ in. and 3 in. by 7 in.	17	0	0	18	10	0
Second yellow deals, 3 in. by 11 in.	18	10	0	20	0	0
,, ,, 3 in by 9 in.	17	10	0	19	0	0
Battens, 2½ in. and 3 in. by 7 in.	13	10	0	14	10	0
Third yellow deals, 3 in. by 11 in. and 9 in.	15	10	0	16	10	0
Battens, 2½ in. and 3 in. by 7 in.	11	10	0	12	10	0
Petersburg: first yellow deals, 3 in. by 11 in.	21	0	0	22	10	0
Do. 3 in. by 9 in.	18	0	0	19	10	0
Battens	13	10	0	15	0	0
Petersburg: second yellow deals, 3 in. by 11 in.	16	0	0	17	0	0
Do. 3 in. by 9 in.	14	10	0	16	0	0
Battens	11	0	0	12	10	0
Third yellow deals, 3 in. by 11 in.	13	10	0	14	0	0
Do. 3 in. by 9 in.	13	0	0	14	0	0
Battens	10	0	0	11	0	0
White Sea and Petersburg:— First white deals, 3 in. by 11 in.	14	10	0	15	10	0
,, ,, 3 in. by 9 in.	13	10	0	14	10	0
Battens	11	0	0	12	0	0
Second white deals, 3 in. by 11 in.	13	10	0	14	10	0
,, ,, 3 in. by 9 in.	12	10	0	13	10	0
,, ,, battens	9	10	0	10	10	0
Pitch-pine: deals	16	0	0	18	0	0
Under 2 in. thick extra	0	10	0	1	0	0
Yellow Pine—First, regular sizes	33	0	0	upwards.		
Oddments	22	0	0	24	0	0
Seconds, regular sizes	24	10	0	26	10	0
Yellow Pine oddments	20	0	0	22	0	0
Kauri Pine—Planks, per ft. cube	0	3	6	0	4	6

WOOD—(*continued*)—

JOINERS' WOOD.—(*Contd.*)	At per standard. £ s. d.	£ s. d.
Danzig and Stettin Oak Logs—		
Large, per ft. cube	0 2 6	0 3 6
Small " "	0 2 3	0 2 6
Wainscot Oak Logs, per ft. cube	0 5 0	0 5 6
Dry Wainscot Oak, per ft. sup. as inch	0 0 7	0 0 8
¼ in. do. do.	0 0 6½	—
Dry Mahogany—Honduras, Tabasco, per ft. sup. as inch	0 0 9	0 0 11
Selected, Figury, per ft. sup. as inch	0 1 6	0 2 0
Dry Walnut, American, per ft. sup. as inch	0 0 10	0 1 0
Teak, per load	17 0 0	21 0 0
American Whitewood Planks—per ft. cube	0 4 0	—
Prepared Flooring—	Per square.	
1 in. by 7 in. yellow, planed and shot	0 13 6	0 17 6
1 in. by 7 in. yellow, planed and matched	0 14 0	0 18 0
1¼ in. by 7 in. yellow, planed and matched	0 16 0	1 1 6
1 in. by 7 in. white, planed and shot	0 11 6	0 1 6
1 in. by 7 in. white, planed and matched	0 12 0	0 14 0
1¼ in. by 7 in. white, planed and matched	0 14 6	0 16 6
¾ in. by 7 in. yellow, matched and beaded or V-jointed brds.	0 11 0	0 13 6
¾ in. by 7 in. do. do. do.	0 14 0	0 18 0
1 in. by 7 in. white do. do.	0 10 0	0 11 6
1 in. by 7 in. do. do. do.	0 11 6	0 13 6

6 in. at 6d. to 9d. per square less than 7 in.

JOISTS, GIRDERS, &c.

	In London, or delivered Railway Vans, per ton. £ s. d.	£ s. d.
Rolled Steel Joists, ordinary sections	6 5 0 ..	7 5 0
Compound Girders, ordinary sections	8 2 6 ..	9 5 0
Angles, Tees and Channels, ordinary sections	7 17 6 ..	8 17 6
Flitch Plates	8 5 0 ..	8 15 0
Cast Iron Columns and Stanchions including ordinary patterns	7 2 6 ..	8 5 6

METALS.

	Per ton, in London. £ s. d.	£ s. d.
IRON—		
Common Bars	7 10 0 ..	8 0 0
Staffordshire Crown Bars, good merchant quality	8 0 0 ..	8 10 0
Staffordshire "Marked Bars"	10 10 0 ..	—
Mild Steel Bars	8 15 0 ..	9 5 0
Hoop Iron, basis price	9 5 0 ..	9 10 0
" " galvanised	17 10 0 ..	—
("And upwards, according to size and gauge.)		
Sheet Iron (Black)—		
Ordinary sizes to 20 g.	9 15 0 ..	—
" " 24 g.	10 15 0 ..	—
" " 26 g.	12 5 0 ..	—
Sheet Iron, Galvanised, flat, ordinary quality—		
Ordinary sizes—6 ft. by 2 ft. to 3 ft. to 20 g.	12 15 0 ..	—
Ordinary sizes to 22 g. and 24 g	13 5 0 ..	—
" " 26 g.	14 5 0 ..	—
Sheet Iron, Galvanised, flat, best quality—		
Ordinary sizes to 20 g.	16 0 0 ..	—
" " 22 g. and 24 g.	16 10 0 ..	—
" " 26 g.	18 0 0 ..	—
Galvanised Corrugated Sheets—		
Ordinary sizes, 6 ft. to 8 ft. 20 g	12 15 0 ..	—
" " 22 g. and 24 g.	13 5 0 ..	—
" " 26 g.	14 0 0 ..	—
Best Soft Steel Sheets, 6ft. by 2ft. to 3 ft. by 20 g. and thicker	11 15 0 ..	—
Best Soft Steel Sheets, 22 g. & 24 g	12 15 0 ..	—
" " 26 g	14 0 0 ..	—
Cut nails, 3 in. to 6 in.	9 5 0 ..	9 15 0

(Under 3 in., usual trade extras.)

LEAD, &c.

	Per ton, in London. £ s. d.	£ s. d.
LEAD—Sheet, English, 3lb. and up	14 5 0 ..	—
Pipe in coils	14 15 0 ..	—
Soil pipe	17 5 0 ..	—
Compo pipe	17 5 0 ..	—
ZINC—Sheet—		
Vieille Montagne ton	26 5 0 ..	—
Silesian	26 0 0 ..	—
COPPER—		
Strong Sheet per lb.	0 0 10½ ..	—
Thin "	0 0 11½ ..	—
Copper nails "	0 0 11 ..	—
BRASS—		
Strong Sheet per lb.	0 0 10 ..	—
Thin "	0 0 11 ..	—
TIN—English Ingots "	0 1 5 ..	—
SOLDER—Plumbers' "	0 0 6½ ..	—
Tinmen's "	0 0 8 ..	—
Plowpipe "	0 0 9 ..	—

ENGLISH SHEET GLASS IN CRATES.

15 oz. thirds	2d. per ft. delivered.
" fourths	1½d. " "
21 oz. thirds	3d. " "
" fourths	2½d. " "
26 oz. thirds	3½d. " "
" fourths	3d. " "
32 oz. thirds	4½d. " "
" fourths	4d. " "
Fluted sheet, 15 oz.	2½d. " "
" 21 oz.	3½d. " "
¼ Hartley's Rolled Plate	1½d. " "
⅜ " " "	2d. " "
½ " " "	2½d. " "

OILS, &c.

	£ s. d.
Raw Linseed Oil in pipes or barrels per gallon	0 1 7
" " " in drums "	0 1 10
Boiled " " in pipes or barrels "	0 1 10
" " " in drums "	0 2 1
Turpentine, in barrels "	0 3 10
" in drums "	0 4 0
Genuine Ground English White Lead per ton	19 0 0
Red Lead, Dry "	19 0 0
Best Linseed Oil Putty per cwt.	0 7 6
Stockholm Tar per barrel	1 12 0

VARNISHES, &c.

	Per gallon. £ s. d.
Fine Pale Oak Varnish	0 8 0
Pale Copal Oak	0 10 6
Superfine Pale Elastic Oak	0 12 6
Fine Extra Hard Church Oak	0 10 0
Superfine Hard-drying Oak, for seats of Churches	0 14 0
Fine Elastic Carriage	0 12 6
Superfine Pale Elastic Carriage	0 16 0
Fine Pale Maple	0 16 0
Finest Pale Durable Copal	0 18 0
Extra Pale French Oil	1 1 0
Eggshell Flatting Varnish	0 18 0
White Copal Enamel	1 4 0
Extra Pale Paper	0 12 0
Best Japan Gold Size	0 10 6
Best Black Japan	0 16 0
Oak and Mahogany Stain	0 9 0
Brunswick Black	0 8 6
Berlin Black	0 16 0
Knotting	0 10 0
French and Brush Polish	0 10 0

TENDERS.

Communications for insertion under this heading should be addressed to "The Editor," and must reach us *not later than* 10 *a.m. on Thursdays.* [N.B.—We cannot publish Tenders unless authenticated either by the architect or the building-owner; and we cannot publish announcements of Tenders accepted unless the amount of the Tender is given, nor any list in which the lowest Tender is under 100*l.*, unless in some exceptional cases and for special reasons.]

* Denotes *accepted.* † Denotes *provisionally accepted.*

BANSTEAD.—For additions to Wingfield, Banstead, for Mr. C. S. Knight. Mr. H. Knight, architect, 75, Aldermanbury, E.C.:—

Wheatley & Sons £986

BEIGHTON (Yorks).—For the erection of stores and house, for the Handsworth and Woodhouse Industrial Co-operative Society, Ltd. Mr. H. L. Paterson, architect, 19, St. James's-street, Sheffield:—

Excavator, Mason, and Bricklayer: John Grant, Mosbro', near Sheffield*	£660 0 0
Carpenter and Joiner: William Turner, Woodhouse, near Sheffield*	319 0 0
Slater: R. Wragg & Son, Chesterfield*	45 11 8
Plasterer: F. & D. Vernon & Son, Beighton, near Sheffield*	51 0 0
Plumber and Glazier: Braithwaite & Co., Leeds and Sheffield*	51 0 0
Painter: R. M. Jones, Sheffield*	29 4 0

BIRKENHEAD. — For sewering, making, etc., Canterbury-road, between New Chester-road and Chatham-road; part Rochester-road and part Albert-road, for the Corporation. Mr. Charles Brownridge, Borough Engineer, Town Hall, Birkenhead:—

C. L. Warren, St. Paul's-road, Seacombe, accepted for ..... { Albert-road .... £293 12 6; Canterbury-road 276 0 0; Rochester-road . 56 2 5

BISHOP'S STORTFORD. — For alterations and painting to workhouse chapel, for the Guardians. Mr. John Laybank Glasscock, architect:—

A. Franklin .. £163 0 0 | H. Champness 156 19 0 | J. R. Taylor & Sons* £137 17 0

[All of Bishop's Stortford.]

BLAKEDOWN (Worcester).—For about 2,000 yards of pipe sewers, etc., and of bacterial disposal works at Blakedown, for the Bromsgrove Rural District Council. Mr. H. W. Taylor, A.M.Inst.C.E., St. Nicholas-chambers, Newcastle-on-Tyne:—

Meredith Bros.	£3,004 0 0
H. Roberts	2,424 0 0
George Holloway	2,303 0 0
Kellett & Co.	2,268 0 0
Waring & Sons	2,108 0 0
T. A. Meredith	2,081 0 0
Johnson Bros.	2,056 0 0
Currall, Lewis, & Martin	2,032 0 0
Vale & Sons	1,984 0 0
Byard & Sons	1,962 0 0
Morley & Sons	1,911 0 0
J. Jameson	1,900 0 0
George Law	1,897 0 0
Johnson & Langley	1,877 0 0
Willetts & Sons	1,835 0 0
A. B. & W. J. Tilt, Birmingham-road, Bromsgrove*	1,760 0 0

BOSTON (Lincs.).—For supply of granite and slag for the Rural District Council:—

Granite.

L. Roper, 70, High-street, Boston	7,142 tons.
L. Sommerfeld, King's Lynn	750 do.

Slag.

Holwell Iron Co., Asfordby, Melton Mowbray	3,891 do.

BRADWELL-ON-SEA.—For six workmen's cottages, for the Maldon Rural District Council. Mr. H. G. Keywood, surveyor, Maldon, Essex:—

Wakelin	£2,250 0 0
Cardnell & Dowsett	1,690 0 0
C. Read	1,668 0 0
Myall & Upson	1,592 0 0
Hy. Potter & Sons	1,500 0 0
W. Gladwell, jun.	1,474 0 0
J. Rayner, East Hanningfield*	1,310 0 0

BRIDLINGTON.—For new business premises in Clough Bridge, for Mr. H. Taylor. Messrs. Brodrick, Lowther, & Walker, architects, Central Chambers, Bridlington:—

J. Rennard	£747 6 4
J. H. Hudson	608 10 0
E. Corner	607 10 0
Smallwood & Shaw	550 2 10
G. Storr & Son	549 0 0
J. R. Stork	518 19 0
W. Hoggard	506 18 6
A. Gardam, Marshall-avenue*	504 10 0
A. A. Booth	501 19 0
Sampson & Siddall	500 18 0

[All of Bridlington].

CHESHUNT.—For sewage disposal works, for the Urban District Council. Messrs. Pollard & Tingle, engineers, 31, Old Queen-street, Westminster:—

Thomas W. Pedrette	£994 17 3
James Dickson	920 0 0
S. Kind	920 0 0
Johnson & Langley	907 19 0
H. Williams	886 11 2
A. Fasey & Son	835 0 4
G. Bell	831 0 0
A. T. Catley	808 0 0
Gronnas & Newton	770 15 3
M. S. Kitteringham, Waltham Cross*	725 0 0

CLAYGATE (Surrey).—For twelve cottages, Claygate, Surrey. Mr. H. Knight, architect, 75, Aldermanbury, E.C.:—

Higby & Rabson £2,400

CLAYGATE.—For three pairs of semi-detached villas, Claygate, Surrey. Mr. H. Knight, architect, 75, Aldermanbury, E.C.:—

Higby & Rabson £3,000

CLAYGATE.—For three pairs of semi-detached villas, Claygate, Surrey. Mr. H. Knight, architect, 75, Aldermanbury, E.C.:—

Wheatley & Sons £3,600

EASTBOURNE.—For 100 tons of flints, for the Guardians of the Eastbourne Union:—

Hall & Co., Croydon Ltd. ..... £0 8 9; Seward Brock .... 0 8 0 | James Wood & Son, Polegate* £0 7 6

GRAYS (Essex).—For alterations and additions to premises Nos. 18 and 20, High-street, Grays, for Mr. C. Mitcham. Mr. Christopher M. Shiner, architect, 6, 7, and 8, Crutched-friars, E.C.:—

J. J. Lawrence, Grays	£1,525
G. Brown, Grays	1,517
E. West, Chelmsford	1,470
J. S. Hammond & Son, Romford	1,453
T. Bruty, Hornchurch	1,377

GRIMSBY.—For the erection of residence, Grimsby, for Mr. C. Bellamey. Mr. Herbert C. Scaping, architect, Court-chambers, Grimsby. Quantities by Mr. J. Watson, Hull:—

Cartledge & Waterman	£1,813 2 6
Wilkinson & Houghton	1,802 0 0
Hewins & Goodhand	1,800 0 0
H. Marrows	1,796 0 0
Gilbert & Kirton	1,791 2 6
J. Markwell Holmes	1,789 5 0
G. & J. Smith	1,785 10 0
W. Ion	1,776 2 1
J. H. Thompson & Sons*	1,750 0 0

GRIMSBY.—For fixtures and furniture at the police extensions, Town Hall, Grimsby. Mr. H. Gilbert Whyatt, A.M.Inst.C.E., Borough Engineer:—

E. B. Trafford	£365 2 0
North of England Furnishing Co.	360 16 2
Rands & Lindup	343 4 0
Unity Wood & Iron Company	330 0 0
H. Kaye	324 0 0
White	322 5 8
J. Hogg	290 0 0
B. W. Smith	284 13 2
Wellington Furnishing Co.	280 0 0
T. R. Waterman, Grimsby*	278 19 0

HAILSHAM (Sussex).—Accepted for the supply of materials for the Rural District Council:—

	Granite. s. d.	Per yard. s. d.	s. d.
Hall & Co., Eastbourne	12 4½	12 6½	12 7½
F. A. Hughes & Co., Greenwich	12 6	—	—
	Stone.		
Wm. Hudson, Brighton	9 10	10 1	10 3
Constable, Hart, & Co., Tovil, Maidstone	10 0	—	—
W. H. Bensted & Son, Maidstone	9 6	—	
Mendip Granite & Asphalte Co., Cranmore, Shepton Mallet	11 0	—	—
Chittenden & Simmons, West Malling	9 3	10 3	10 5
F. A. Hughes & Co., Greenwich	10 4	—	—
	Flints.		
Hall & Co., Croydon	6 7	—	—
	Gravel.		
Somerset Fullers Earth & Ochre Co., Emboro', Bath		s. d. 12 0 per ton.	
Hall & Co., Croydon		5 7 do.	
William Hudson, Brighton		6 8 do.	
	Clinkers.		
William Hudson, Brighton		5 6 do.	

HODDESDON (Herts).—For pitching, kerbing, etc., footpaths, for the Hertfordshire County Council. Mr. Urban A. Smith, County Surveyor, Hatfield:—

M. S. Ketteringham	£399 14 0
Free & Sons	332 2 3
A. T. Catley	322 0 0
Griffith & Co.	312 18 10
W. Andrews	311 5 11
W. H. Wheeler	307 18 10
Wallace & Inns	307 1 6
Nowell & Sons	301 19 5
J. Jackson, Forest Gate*	299 17 3

LONDON.—For the provision of heating apparatus at the Lots-road pumping station, for the London County Council:—

Clements, Jeakes, & Co.	£200 0 0
Clark, Hunt, & Co.	147 10 0
London Warming and Ventilating Co., Ltd.	144 10 0
Comyn Ching & Co., Ltd.*	138 0 0

LONDON SCHOOL BOARD TENDERS.

The following lists of Tenders were submitted by the Works Committee of the London School Board at Thursday's meeting of the Board. Mr. T. J. Bailey is the Board's Architect:—

Manor-lane Site, Lee, for Three Brick Buildings for Temporary Accommodation.

Mitson & Harrison	£4,716 10 0
W. Harris	4,488 0 0
Holliday & Greenwood, Ltd.	4,366 0 0
J. Smith & Sons, Ltd.	4,320 0 0
H. Groves	4,315 0 0
T. D. Leng	4,297 0 0
Thomas & Edge	4,272 0 0
F. & H. F. Higgs	4,270 0 0
E. Lawrance & Sons	4,254 0 0
J. Appleby & Sons	4,220 0 0
W. Downs	4,193 0 0
E. P. Bulled & Co.	4,159 0 0
J. & C. Bowyer*	4,045 0 0

Basnett-road Site, Battersea, for Erection of School for Physically Defective Children.

General Builders, Ltd.	£5,370	W. Johnson & Co., Ltd.	£4,499
J. Simpson & Son	5,091	W. Akers & Co.	4,465
Leslie & Co., Ltd.	4,900	Holloway Bros, Ltd.	4,463
Treasure & Son	4,690	Stimpson & Co.	4,360
Hudson Bros.	4,678	E. P. Bulled & Co.	4,344
Lathey Bros.	4,655	E. Triggs	4,296
J. Smith & Sons, Ltd.	4,579	J. Garratt & Son*	4,257
		Edwards & Medway	3,578

Plassy-road Site, Catford, for Special School for Sixty Mentally Defective Children.

F. G. Minter	£4,133 0 0
Rice & Son	3,743 0 0
J. Garratt & Son	3,664 0 0
Edwards & Medway	3,649 17 0
Thomas & Edge	3,633 0 0
E. P. Bulled & Co.	3,554 0 0
T. D. Leng	3,498 0 0
J. & C. Bowyer	3,487 0 0
J. Appleby & Sons	3,310 0 0
W. Akers & Co.*	3,141 0 0

Capland-street Site, Lisson-grove, for Enlarging Deaf Centre, etc.

J. Simpson & Son	£2,711 0 0
F. Gough & Co.	2,652 0 0
G. Neal	2,642 0 0
Marchant & Hirst	2,615 0 0
H. Wall & Co.	2,487 0 0
J. Wilmott & Sons	2,474 0 0
G. S. S. Williams & Son	2,429 0 0
General Builders, Ltd.	2,312 0 0
Stevens Bros.	2,296 0 0
Treasure & Son	2,286 0 0
L. H. & R. Roberts*	2,273 0 0
J. Allen & Sons, Ltd.	2,035 10 0

Mowlem-street School, Cambridge Heath, for Sanitary and Drainage Works.

E. Lawrance & Sons	£3,258	L. H. & R. Roberts	£2,888
G. S. S. Williams & Son	3,144	J. Peattie	2,878
A. Porter	3,084	Ashby & Horner	2,871
R. P. Beattie	2,968	J. W. Falkner & Sons	2,867
Stevens Bros.	2,895	F. Bull	2,856
J. Willmott & Sons	2,895	McCormick & Sons*	2,491

"Hither Green" School, Lewisham, for Re-fitting Offices, etc.

H. Groves	£902	J. W. Falkner & Sons	£723
Holliday & Greenwood, Ltd.	895	G. Parker	695
W. Downs	850	Maxwell Bros., Ltd.	680
Lathey Bros.	800	J. & C. Bowyer	668
		H. Leney & Son*	500

Haverstock-hill School, St. Pancras, for Re-fitting Offices, etc.

T. Cruwys	£398 0 0
C. Dearing & Son	366 0 0
Barrett & Power	359 3 0
J. Peattie	358 0 0
Stevens Bros.	358 0 0
C. W. Killingback & Co.	342 0 0
Marchant & Hirst	329 0 0
F. Bull*	329 0 0

Princess May-road Site, Stoke Newington, for Adapting House, No. 44, Barrett's-grove, for occupation of Schoolkeeper.

F. W. Harris	£520 0 0
A. Porter	513 0 0
Bate Bros.	470 0 0
W. Silk & Son	457 0 0
C. Willmott & Son	425 0 0
Woollaston Bros.*	387 10 0

Cable-street Site, St. George's-in-the-East, for Adaptation of House, No. 210, Cable-street, for use as Housewifery Centre.

Barrett & Power	£497 0 0
Vigor & Co.	474 0 0
Parrott & Isom	439 0 0
G. Barker	404 0 0
J. T. Robey	370 0 0
A. J. Sheffield	363 0 0
J. Haydon & Sons*	315 12 0

Wilsham-street Site, Hammersmith, for Adaptation of No. 1, Gordon-cottages, for use as Housewifery Centre.

G. Neal	£367	Lathey Bros.	£329
W. Hammond	360	General Builders, Ltd.	287
E. Triggs	346	S. Polden	265
R. S. Ronald	335	E. B. Tucker*	258
J. Garrett & Son	331		

Beaufort House New School, Fulham, for Heating Apparatus.

G. Davis	£850 0 0
H. C. Price Lea & Co.	845 0 0
R. H. & J. Pearson Ltd.	737 0 0
J. Richmond & Co., Ltd.	711 0 0
J. Wontner-Smith, Gray, & Co.	692 0 0
Brightside Foundry & Engineering Co., Ltd.	670 0 0
B. Harlow & Son	647 0 0
Comyn Ching & Co., Ltd.	646 10 0
Bates & Sons	640 0 0
J. Defries & Sons, Ltd.*	621 0 0

Childerley-street Higher Grade School, Fulham, for Heating Apparatus.

G. Davis	£820 0 0
J. & F. May	645 0 0
C. Kite & Co.	599 0 0
B. Harlow & Son	567 0 0
Brightside Foundry and Engineering Co., Ltd.	545 0 0
Wipple Bros. & Row	545 0 0
J. Richmond & Co., Ltd.	530 4 0
G. & E. Bradley*	491 0 0

Blackheath-road new Higher Elementary School, for Heating Apparatus.

J. Esson & Son	£850 0 0
W. G. Cannon & Sons	599 0 0
J. & F. May	564 0 0
R. H. & J. Pearson, Ltd.	534 0 0
J. Wontner-Smith, Gray, & Co.	478 10 0
B. Harlow & Son	470 0 0
C. Kite & Co.	465 0 0
G. & E. Bradley*	421 0 0

Cromer-street School, Brunswick-square, for Heating Apparatus.

G. Davis	£596 0 0
J. Esson & Son	385 0 0
W. G. Cannon & Sons	368 0 0
Werner, Pfleiderer, & Perkins, Ltd.	301 2 5
J. Sloper & Co.	298 17 6
Bates & Sons	298 0 0
Palowkar & Sons	294 0 0
J. Wontner-Smith, Gray, & Co.	284 10 0
R. Clarke	280 0 0
G. & E. Bradley*	251 0 0

The "Millbank" School, Westminster, for Heating Apparatus for Enlargement.

C. Kite & Co.	£75 0 0
W. Simmons	68 6 0
B. Harlow & Son	68 0 0
J. Esson & Son	58 6 0
J. Richmond & Co., Ltd.	45 16 9
Comyn Ching & Co., Ltd.	44 10 0
G. & E. Bradley	43 10 0
J. Wontner-Smith, Gray, & Co.	42 0 0
R. H. & J. Pearson, Ltd.*	42 0 0

For Repairing Desks, etc., at the Furniture Stores in Broadwall, Blackfriars.

H. J. Williams	£414 0 0
W. Martin	286 10 0
E. Spencer & Co.	213 17 0
G. M. Hammer & Co., Ltd.	200 0 0
T. Cruwys	197 0 0
London School Furniture Co.	190 0 0
H. Bouneau*	150 0 0

LONDON.—For Bolton's Library, Knightsbridge, for the Exors. of the late Mrs. Calliard. Mr. H. Knight, architect, 75, Aldermanbury, E.C.:—
Turtle & Appleton £5,100

LONDON. — For rebuilding The Three Crowns, public-house, Old Jewry, E.C., for Miss J. Fry. Mr. H. Knight, architect, 75, Aldermanbury, E.C.:—
J. Nicks & Co. £3,410

LONDON. — For alterations to The Victoria public-house, Snow-hill, Smithfield, E.C., for the Exors. of the late S. H. Baker. Mr. H. Knight, architect, 75, Aldermanbury, E.C.:—
Inkpen & Co. £890

LONDON.—For alterations to The Bishopsgate restaurant, Old Broad-street, for R. Charles & Co. Mr. H. Knight, architect, 75, Aldermanbury, E.C.:—
Adamson & Sons £950

LONDON.—For additions to Nos. 434 and 436, Brixton-road, for Messrs. Quinn & Axtens. Mr. H. Knight, architect, 75, Aldermanbury, E.C.:—
J. Nicks & Co. £2,186

LONDON.—For paving of footways on Section A., Totterdown-fields Estate, Tooting, for the London County Council:—

C. W. Killingback & Co.	£2,085 3 6
G. Wilson	1,662 5 4
The Adamant Stone Paving Co.	1,577 0 0
The Victoria Stone Co.	1,378 9 6
F. J. Coxhead*	1363 13 6

LONDON.—For the erection of a block of offices to be called Parliament-chambers, Great Smith-street, Westminster. Messrs. Palgrave & Co., architects, 28, Victoria-street, S.W. Quantities by Mr. James Farrell:—

J. F. Holliday	£26,500
Kirk & Kirk	24,756
Martin, Wells, & Co., Ltd.	24,419
C. Gray	24,119
Frank Bush	22,789
J. Ferguson & Co.‡	22,500
J. Mowlem & Co., Ltd.	21,898
W. Pattinson & Sons	21,875
Perry & Co.	21,688
G. E. Wallis & Sons	21,444
Patman & Fotheringham	21,160
W. H. Lorden & Son	20,969
L. Whitehead & Co., Ltd.	20,875
F. G. Minter	20,790
Wm. Smith & Sons	19,894

‡ Too late for consideration.

LONDON.—For 7,000 yards of tar-paving works, Penge, for the Penge Urban District Council:—
Constable, Hart, & Co., Kentish Town ..... Tar-paving 1s. 9d. per yd. sup. Wood-edging 2½d. per ft. lin.

LUSTLEIGH (Devonshire). — For water supply works, Lustleigh, for Newton Abbot Rural District Council. Mr. Samuel Segar, engineer, Union-street, Newton Abbot. Quantities by engineer:—

W. C. Shaddock	£3,400 0 0	J. W. Deane, Ltd.	£2,480 15 0
Pethick Bros.	3,330 0 0	E. Pike	2,415 0 0
S. Roberts	3,095 0 0	Dart & Pollard	2,385 0 0
J. Shaddock	2,802 2 4	P. Wilson & Co.	2,263 0 0
Jenkins & Son	2,800 0 0	W. E. Bennett	2,153 2 6
Yeo & Son	2,719 0 0	Haskings & Best, Teignmouth*	2,005 0 0
C. Lang	2,686 0 0		
J. F. Price	2,515 0 0		

LOWER HAGLEY (Worcestershire).—For the construction of about 7,600 yards of pipe sewer, etc., and of bacterial sewage disposal works, for the Bromsgrove Rural District Council. Mr. H. W. Taylor, A.M.Inst.C.E., St. Nicholas-chambers, Newcastle-on-Tyne:—

H. Roberts	£5,420 0 0
Kellett & Co.	5,410 0 0
Waring & Sons	5,247 0 0
Barker Bros.	4,939 0 0
Johnson & Langley	4,897 0 0
Willetts & Sons	4,858 0 0
J. A. Meredith	4,702 0 0
Johnson Bros.	4,691 0 0
Currall, Lewis, & Martin	4,684 0 0
Vale & Sons	4,679 0 0
Byard & Sons	4,609 0 0
Morley & Sons	4,405 0 0
Jameson & Son	4,303 0 0
George Law	4,247 0 0
George Holloway	4,218 0 0
A. B. & W. J. Tilt, Birmingham-road, Bromsgrove*	4,107 0 0

MAESTEG (Wales).—For the erection of a Calvinistic Methodist Chapel, Nantyfyllen, for the Calvinistic Methodist Denomination. Architect: The Rev. W. Jones, Ton Pentre, Glamorganshire:—

William John Jackson	£2,839 0 0
Thomas James	2,200 0 0
Stephen Lewis	2,100 0 0
John Nicholas, Aberavon*	1,987 0 0

MAIDENHEAD.—For the erection of a free library. Messrs. Arthur McKewan and G. H. V. Cale, joint architects, Birmingham. Quantities by Mr. Geo. Hackford, Queen Anne's-gate, Westminster:—

Grubb & Vidler	£5,515 0 0	Silver & Sons	£5,094 0 0
Bissley	5,359 10 0	Edwards	5,057 0 0
J. K. Cooper & Sons	5,292 0 0	Creed	4,921 0 0
		Theaker	4,781 14 0
		Cox & Sons†	4,698 0 0

[All of Maidenhead.]

PETERBOROUGH.—For the supply of 15 in. and 6 in. glazed drain pipes, etc., for the City Council. Mr. J. W. Walshaw, City Surveyor, Guildhall, Peterborough:—
Whitaker & Co., Grimshaw Park, Blackburn:—

	s.	d.	
15 in. pipes	4	1	per yard.
15 in. by 6 in. junctions	6	1½	each.
6 in. pipes		10½	per yard.
6 in. bends		10½	each.
15 in. manhole blocks	13	6	each.
12 in. manhole blocks	7	0	each.
6 in. stoppers	3	6	per dozen.

PURLEY.—For the erection of residence, Central-road, Purley, Surrey, for Mr. J. W. Forrester. Mr. J. Halsted Waterworth, architect and surveyor, 281a, Queen's-road, New Cross Gate, S.E., and Welling, Kent:—

Hanscomb & Smith	£2,763 0 0
S. R. Best	2,175 0 0
David Waller	1,949 0 0
W. H. Baldwin	1,945 0 0
T. Vaughan & Sons, Caterham Valley*	1,718 0 0

RICKMANSWORTH.—For new offices at Rickmansworth, for the Rickmansworth and Uxbridge Valley Water Company. Mr. H. Knight, architect, 75, Aldermanbury, E.C.:—
Turtle & Appleton £2,820

SALISBURY.—For excavating site and building foundation walls for new class-rooms and cubicles, at Barnard's Cross, for the Salisbury Diocesan Training College. Messrs. J. Harding & Son, architects, 58, High-street, Salisbury:—

Harris Bros.	£240 0 0	Wort & Way*	£225 0 0
H. J. Kite	225 0 0	Tryhorn & Son	210 10 0

[All of Salisbury.]

SHEFFIELD.—Accepted for new stores, Northfield-road, Crookes, for Ecclesall Industrial and Provident Society, Ltd. Mr. H. L. Paterson, architect, 119, St. James's-street, Sheffield:—

Mason and Bricklayer: E. Butcher, Wadsley, Sheffield	£943 18 3
Carpenter and Joiner: J. I. Robertson, Sheffield	350 0 0
Slater: Pickles Bros., Leeds	40 10 0
Plasterer: C. R. Chadwick, Sheffield	76 0 0
Plumber and Glazier: Snowden & Son, Sheffield	179 0 0
Painter: G. Cross, Derby	42 1 4

[Total, £1,631 9s. 7d.]

SOUTHAMPTON.—For iron fire escape, staircase, and bridge from tramps' ward and fire escape from boys' dormitory at the workhouse, for the Guardians. Messrs. Mitchell, Son, & Gutteridge, acrhitects, 9, ortland-street, Southampton:—

Stevens & Co.	£700	Hayward Bros.	£568
H. Stiles	691	Jenkins & Sons	567
Williams & Son	647	Shalders	566
Doggrell & Sons	631	E. Wood & Co.	562
Hall & Sons	606	Norton	549
General Iron Foundry Co.	604	Cawte	537
		Grace	480
Herring & Sons	582	Nichol, Southampton*	471
Udall & Co.	582		

SOUTHWICK (Sussex).—For street works (Green-road, South View-road, and Underdown-road), for the Urban District Council. Mr. G. W. Warr, Surveyor. Quantities by Surveyor:—

H. A. Chambers	£3,073 9 2	J. Parsons & Sons	£2,839 0 0
E. H. King	2,945 14 0	W. A. McKellar	2,829 0 0
J. Whittington	2,899 2 6	Peerless, Denis, & Co., E'bo'rne*	2,747 0 0
Woolgar Bros.	2,897 1 8		
D. & J. Hall	2,843 7 6		

(*Continued on page* 154).

COMPETITIONS, CONTRACTS, AND PUBLIC APPOINTMENTS.

(For some Contracts, &c., still open, but not included in this List, see previous issues.)

COMPETITIONS.

Nature of Work.	By whom Required.	Premiums.	Applications to be in
*Designs for Branch Public Libraries	County Borough of St. Helens	20*l.* and 10*l.*	Mar. 31
Isolation Hospital	Perth Town Council	30, 20, and 10 guineas	April 6
*Proposed Free Library	Malvern U.D.C.	30*l.*, 20*l.*, and 10*l.*	April 8

CONTRACTS.

Nature of Work or Materials.	By whom Advertised.	Forms of Tender, &c., supplied by	Tenders to be delivered
Reconstruction, Brougham Arms H., Kirkgate, Leeds.	.....	S. Jackson & Son, Architects, Tanfield-chambers, Bradford	Feb. 6
Shop Fixtures, etc., Ferry Hill Village Store	Coxhoe Co-operative Society	The Manager, Ferry Hill, Durham	do.
Three Hou. & Shop, Cresswell-st., Pagmoor, Barnsley	.....	G. Moxon, Architect, Barnsley	do.
Paving, etc., Works	Manchester Corporation	Paving Department (Surveyor's Office), Town Hall, Manchester	Feb. 8
2¼ miles of c.i. Pipes, Elgin	Gt. N. of Scotl'd & Hi'l'd Ry. Co.	Office of Engineer, Great North of Scotland Railway, Aberdeen	do.
Intake Tank, etc., for Water Supply	do.	do.	do.
Addition to Teacher's House, Archiestown	.....	J. Wittet, Architect, Elgin, N.B.	do.
Sewers and Sewage Purification Works, Menstrie	Clackmannanshire C. C.	W. R. Copland, C.E., 146, West Regent-street, Glasgow	do.
Fire Hose Fit'gs, Cott. Homes, Oliver Mt., Wavertree	Liverpool Parish Council	Parish Offices, Brownlow Hill, Liverpool	do.
Shop Premises, New Albion-place, Leeds	.....	T. Winn & Sons, Architects, 92, Albion-street, Leeds	do.
Alteration, etc., Men's Day Room at Workhouse	East Stonehouse Guardians	F. A. Wiblin, Architect, Town Hall, Stonehouse	do.
Repair of Houses in Victoria-crescent, Elgin	.....	J. Wittet, Architect, Elgin	do.
2,000 Tons Welsh Granite Setts	Manchester Corporation	Chief Clerk, Highways Department, Town Hall, Manchester	do.
Shop Fronts, Market-street, Bury, Lanc.	District Co-op. Provision Society	D. Hardman, Architect, Agur-street, Bury	do.
Roof Work, Queen-st. Scot's Ch. National Schl, Cork	.....	R. Walker & Son, Architects, 17, South-mall, Cork	do.
Small Addition to Isolation Hospital, Tewkesbury	.....	Borough Surveyor's Office, Station-street, Tewkesbury	do.
Water Mains, North Benfleet and Bowers Gifford	Billericay R.D.C.	R. J. W. Layland, Billericay, Essex	do.
Pipe Sewer, Morriston, Swansea	Corporation	R. H. Wyrill, Borough Engineer, Swansea	do.
Paving Streets	Musselburgh Town Council	G. Landale, Burgh Surveyor, Musselburgh, Edinburgh	do.
Carting Road Material	Branston R.D.C.	J. W. Watson, Surveyor, Potterhanworth, Lincolnshire	Feb. 9
Street Works	Cardiff Corporation	Borough Engineer (W. Harpur, M.I.C.E.), Town Hall, Cardiff	do.
Stone Supply	do.	do.	do.
Stores	do.	do.	do.
Portland Cement	do.	do.	do.
Asphalting, Sick Asylum, Devon's-road, Bromley, E.	Man'grs, Poplar & Stepney S. A. D.	Engineer at the Asylum	do.
Repairs to Schools	Leeds Education Committee	Architect's Department, Education Offices, Leeds	do.
Street Works, Brickfield-road, etc.	Southampton Corporation	Borough Engineer's Office, Market Chambers, Southampton	do.
House & Shop, S'th-side, Clough Bde.-rd., Bridlington	C. Cast	J. Earnshaw, Architect, Carlton House, Bridlington	do.
Alteration, etc., of Properties in Clare-st., Bridgwater	Town Council	Municipal Offices, High-street, Bridgwater, Somerset	do.
Painting Mascotte House, 48, Promenade, Bridlington	Property Committee	Borough Surveyor, Town Hall, Bridlington	do.
Painting Shelter & Bandstand, Prince's-pde. ,,	do.	do.	do.
Railway Weighbridge	Elec. Committ., S'thampton Corp.	Borough Electrical Engineer, Electricity Works, Southampton	Feb. 10
Roadway, Llathygae, near Pumpsaint, Llanwrda	H. M. Lloyd	D. Jenkins, F.R.I.B.A., Llandilo	do.
Water Supply	do.	do.	do.
Stores	Glasgow & S.W. Ry.	Stores, Superintendent's Office, Kilmarnock	do.
Wire Fencing	do.	Engineer, St. Enoch Station, Glasgow	do.
Street Works, Cathays	Cardiff Corporation	W. Harpur, M.Inst.C.E., Borough Engineer, Cardiff	do.
Cartage of Road Materials	Warwickshire County Council	County Surveyor (J. Wilmot), 6, Waterloo-street, Birmingham	do.
New Wing and Kitchen, St. Jarlath's Coll., Tuam	Rev. Dr. Healey	D. Morris, Building Surveyor, 68, Harcourt-street, Dublin	do.
Stores	Mid. R. Co.; N. Co. Com't., Ireland	Mr. Ellis, Stores Superintendent, York-road Station, Belfast	do.
Making School Doors Open Outwards	East Ham Education Committee	Education Office, Wakefield-street, East Ham	do.
Materials, Highways and Sewers Committees	Stockport Corporation	J. Atkinson, A.M.Inst.C.E., Borough Surveyor, Stockport	do.
Works on Highways	do.	do.	do.
Annual Contracts	Hammersmith Borough Council	H. Mair, Borough Surveyor, Town Hall, Hammersmith	do.
Hot Water Heating Apparatus, County Council Offices	Londonderry County Council	T. B. Adams, Secretary, County Court House, Londonderry	do.
Electric Lighting, Armley Branch Library	Leeds Corporation	Town Clerk, Town Hall, Leeds	do.
Two Filters, etc., Balamenach, West Loch, Tarbert	Tarbert Water Committee	Warren & Stuart, Engineers, 94, Hope-street, Glasgow	do.
C.i. Pipes and Castings	do.	do.	do.
3,830 Yards of 6 in. Pipes, etc.	Glyncorrwg U.D.C.	W. P. Jones, Council Offices, Cymmer, Port Talbot	do.
3,830 Yds. of 6 in. Mains (Lloyd's-ter., Cymmer, etc.)	do.	do.	do.
100 Lineal Yards Water Main at Gilfach Goch	Llantrisant, etc., R.D.C.	G. S. Morgan, Surveyor, School-street, Pontyclun	do.
150 Yards Water Drains, Mill-street, Tonyrefail	do.	do.	do.
Retaining Walls	do.	do.	do.
Sewers and Water Mains, Llantrisant	do.	do.	do.
Additions to Farm Steading, Kingask, nr. Cupar, Fife	.....	D. Storrar, Architect, Cupar, Fife	do.
70,000 Best Stock Bricks	Gillingham Corporation	Borough Surveyor's Office, Gardiner-street, Gillingham, Kent	do.
930 Yards Wrot-Iron Fence, etc.	do.	do.	do.
Ornamental Gates, etc.	do.	do.	do.
Road Works, etc. (King-street, etc.), Hurst	Hurst U.D.C	S. Shirt, Surv., Council Offices, King-st. Hurst., nr. Ashton-u.-Lyne	do.
Hauling Materials for Roads	Weobley R.D.C.	T. Gwillim, Weobley, R.S.O.	Feb. 1
Annual Contracts	Lewisham Borough Council	Surveyor's Department, Town Hall, Catford	do.
Stores, Waterworks Department	Southampton Corporation	W. Matthews, Waterworks Engineer, 18, French-st., Southampton	do.
Eleven Houses, Arncliffe-terrace, Horton	.....	W. Rycroft, Architect, Bank-buildings, Manchester-road, Bedford	do.
Wat. Sup. W'ks, Knockando-Glenlivet Dis., Dalbeattie	.....	C. C. Doig, C.E., Elgin	do.
Branch Store, Drighlington	Co-operative Society, Limited	Society's Offices, Drighlington	do.
Cartage Work	Hackney Borough Council	Norman Scorgie, Borough Engineer, Town Hall, Hackney, N.E.	do.
Alterations etc., to 10, Walmer-villas, Bradford	.....	C. H. Hargreaves, Architect, Exchange, Bradford	do.
Four Ornamental Kiosks	Property Committee, Bridlington	E. R. Matthews, C.E., Borough Surveyor, Town Hall, Bridlington	do.
Dwarf Wall	do.	do.	do.
Iron Palisading	do.	do.	do.
Colonnade	do.	do.	do.
House and Shop, Clough Bridge, Bridlington	Spencer & Son	A. T. Martindale, Architect, 66, Wellington-road, Bridlington	do.
Restoration Work, Ch. of St. Lucius, Farnley Tyas	.....	J. Kirk & Sons, Architects, Huddersfield	do.
Store, Chatsworth-road, Worthing	.....	Borough Surveyor, Municipal Offices, Worthing	do.
*Road-making, Paving, and Lighting Works	Kingston-on-Thames Corp.	Borough Surveyor Clattern House, Kingston-on-Thames	do.
Thirty-three Houses at Tirphil	Graig-Rhymney Building Club	T. Roderick, Architect, Glebeland, Merthyr Tydfil	Feb. 12
Alterations, etc., Chopwell Hotel	Consett Iron Co., Ltd.	C. F. Oliver, Architect, General Offices, Consett	do.
Gates & Railings, Buslingthorpe Grd., Chapelt'wn-rd.	Leeds Corporation	City Surveyor's Office, Leeds	do.
Two Museum Cases and Five Cupboards	Education Committee, Bootle	Elementary Education Offices, Balliol-road, Bootle	do.
Two Shops, High-street, Merthyr	.....	C. M. Davies, Architect, Merthyr, Wales	do.
Altera., Old Bridewell-bdgs., Tipperary (Tech. Sch.)	.....	W. H. Hill & Son, Architects, 28, South-mall, Cork	do.
Rag Warehouse and Stables, Townend, Morley	H. B. & J. E. Banks	T. A. Buttery & S. B. Birds, Architects, 1, Basinghall-sq., Leeds.	do.
*Additional Houses, etc., at Netley Coastguard Station	Admiralty	Superintending Engineer, H.M. Dockyard, Portsmouth	do.
*New Coastguard Station, etc., St. Leonards	do.	Director of Works Dept., 21, Northumberland-avenue, W.C.	do.
*Supply of Chairs	London County Council	Parks Department, 11, Regent-street, S.W.	do.

CONTRACTS.—*Continued.*

Nature of Work or Materials.	By whom Advertised.	Forms of Tender, &c., supplied by	Designs to be delivered
2,800 Tons c.i. Pipes, etc., Masham	Harrogate Corporation	E. W. Dixon, M.Inst.C.E., 14, Albert-street, Harrogate	Feb. 13
Street Works, Medlock-street, etc.	Droylsden U.D.C.	C. Hall, Surveyor to Council, 10, Ashton-road, Droylsden	do.
Road Material and Cartage	Bedfordshire County Council	County Surveyor, Shire Hall, Bedford	do.
Materials, etc.	Richmond (Surrey) Town Council	J. H. Brierley, Borough Surveyor, Richmond, Surrey	do.
Materials (Four Divisions)	Glamorgan County Council	T. Lloyd Edwards, County Surveyor, Town Hall, Bridgend	do.
Haulage	do.	do.	do.
Tools and Ironmongers' Goods	do.	do.	do.
275 ft. Stoneware Pipe Sewer	Berkhamsted R.D.C.	W. H. Thomas, Surveyor, Tring	do.
Materials, Blackburn	The Corporation	W. Stubbs, Borough Engineer, Municipal Offices, Blackburn	do.
*Concrete and Brick Foundations for Acid Works	Coventry Corporation	F. W. Stevenson, Gas Works, Coventry	do.
Steel Roof, Malahide Station	Great Northern Ry. Co. (Ireland)	W. H. Mills, Engineer, Amiens-street Terminus, Dublin	Feb. 15
Steel Footbridges, Malahide and Tanderagee	do.	do.	do.
Syphon Pipe, 70 ft. long, Dublin	do.	do.	do.
Furniture, etc.	Colne & Holme J'nt. H'sp't'l Com	J. Berry, Architect, 3, Market-place, Huddersfield	do.
*Double Tenement Dwellings, Houses, Shops, etc.	Brighton Borough Council	Town Clerk, Town Hall, Brighton	do.
Eight Shops and Houses	do.	do.	do.
Filling-in Front of Hamilton Terrace Cliffs	Felixstowe and Walton U.D.C.	S. E. Fisher, Surveyor to Council, Town Hall, Felixstowe	do.
Electric Wiring, Pathhead Hall	Kirkcaldy Corporation	O. F. Francis, Burgh Electrical Engineer, Victoria-rd., Kirkcaldy	do.
Furniture, Tooting Bec Receiving Home, S.W.	Metropolitan Asylums Board	Office of the Board, Embankment, London, E.C.	do.
Drainage Work, Wester Gauldwell Farm	.....	R. Hendry, Forester, Arndilly, N.B.	do.
Extension of Free Library, Great Yarmouth	Free Library Committee	J. W. Cockrill, Borough Surveyor, Town Hall, Great Yarmouth	do.
Electric Wiring, Euclid-street School	Swindon Corporation	J. G. Griffin, Electrical Engineer, Electricity Works, Swindon	do.
Making up Burlington-road, Swanage	U.D.C.	T. Randell, Clerk, Town Hall, Swanage	do.
Wood Paving, Norton Folgate, etc.	Shoreditch Borough Council	J. Rush Dixon, Borough Engineer, Town Hall, Old-street, E.C.	Feb. 16
Thirty-eight Labourers' Cottages	Rathdown No. 1 R.D.C.	R. M. Butler, Architect, Dawson-chambers, Dawson-st., Dublin	do.
Repair of Five Cottages	do.	do.	do.
Fuel Economisers, etc., Tramway Works	L.C.C.	County Hall, Spring-gardens, London	do.
Timber Retainer, etc., at The Howl-Ings	Tynemouth Corporation	Borough Surveyor's Office, North Shields	do.
Supply of Whinstone and Limestone	Middlesbrough R.D.C.	W. H. Dixon, Dis. Surv., Kirkby-in-Cleveland, nr. Stokesley, R.S.O.	do.
*Removal of Clinker for One Year	Bermondsey Borough Council	Borough Surveyor, Town Hall, Spa-road, S.E.	do.
Road Materials	Potterspury R.D.C	J. B. Fairchild, Surveyor, Potterspury, Stony Stratford	Feb. 17
Carting Materials	do.	do.	do.
Urinal Stalls, Underground Lavatory, Albert-square	Manchester Corporation	City Surveyor's Office, Town Hall, Manchester	do.
Retorts	Millom U.D.C.	W. T. Lawrence, Clerk, Dist. Council Offices, Millom Cumberland	do.
Twelve Houses, Haverton-hill, Middlesbrough	D. & F. Munro	Moore & Archibald, Architects, 27, Albert-road, Middlesbrough	do.
*Erection of Shelters, South Park, Fulham	Fulham Borough Council	Borough Engineer, Town Hall, Fulham, S.W.	do.
*Excavating Trenches, Laying Pipes, etc.	U.D.C. of Chiswick	Council's Surveyor, Town Hall, Chiswick	do.
*Ventilating Shafts	do.	do.	do.
Sewerage Works, South Elmsall	Hemsworth R.D.C.	T. H. Richardson, Engineer, Hemsworth, near Wakefield	Feb. 18
Granite at Stations	East Retford Corporation	J. D. Kennedy, Borough Surveyor, East Retford	do.
Boiler House, District Lunatic Asylum, Killarney	.....	J. F. Fuller, Architect, 179, Great Brunswick-street, Dublin	do.
Extensions at Sanatorium, Lancaster	Sanitary Committee	Borough Surveyor, Market-square, Lancaster	do.
*Fire Mains at Tanner-street Workhouse	St. Olaves' Union	Newman & Newman, 31, Tooley-street, S.E.	do.
Annual Contracts, Sheffield	Highway and Sewerage Committee	C. F. Wike, City Surveyor, Town Hall, Sheffield	Feb. 19
Board School, Long Lee, Keighley	Keighley School Board	A. P. Harrison, Architect, 18, Cooke-lane, Keighley	Feb. 20
Road Materials, etc.	East Sussex County Council	F. J. Wood, County Surveyor, County Hall, Lewes	do.
Steel Rails, Masham Scheme Quarry Railway	Harrogate Corporation	E. W. Dixon, M.Inst.C.E., 14, Albert-street, Harrogate	do.
2,000 Wooden Sleepers for Light Railway, Masham	do.	do.	do.
Workmen's Houses, Bangor, Wales	City Council	J. Gill, City Surveyor, Town Hall, Bangor	do.
*Infectious Diseases Hospital	Reading Borough Council	C. Smith & Son, Architects, 164, Friar-street, Reading	do.
Works in 10 Streets and 18 Passages, Simms Cross	Widnes Corporation	J. S. Sinclair, Borough Surveyor, Town Hall, Widnes	Feb. 22
Waterworks, Dutton and Preston-o'-th'-Hill	Runcorn R.D.C.	G. F. Ashton, Clerk, 71, High-street, Runcorn	do.
Ry. Sta.-bdgs., Blackw'd to Darvel & Muir Kirk Rys.	Caledonian Ry. Co.	Engineer's Office, Buchanan-street Station, Glasgow	do.
*Wood Paving Works	Hornsey Town Council	Borough Engineer, Southwood-lane, Highgate, N.	do.
*Annual Contracts	St. Pancras Borough Council	Borough Engineer, Town Hall, Pancras-road, N.W.	do.
Five Cottage Homes, Bedwellty Park, Tredegar	Bedwellty Guardians	W. Beddoes Rees, A.R.I.B.A., 37, St. Mary-street, Cardiff	Feb. 23
Drainage of Village of Delgany, etc.	Rathdown No. 2 R.D.C.	Ryan & Butler, Engineers, 12, Dawson-street, Dublin	do.
Robins-lane Intercepting Sewer, St. Helens, Lancs.	St. Helens Health Committee	G. J. C. Broom, Borough Engineer, St. Helens	do.
*Additions and Alterations to Epsom Workhouse	Epsom Union	H. D. Searles Wood, Architect, 157, Wool Exchange, E.C.	do.
Free Library, Knutsford	Knutsford U.D.C.	Darbyshire & Smith, Architects, 17, Brazennose-st., Manchester	Feb. 24
*Hiring of Lindsey Jetty, Cheyne Walk	Chelsea Borough Council	Borough Surveyor, Town Hall, Chelsea, S.W.	do.
Burr Groin, Sea Defence Works, The Parade	Walton-on-Naze U.D.C.	H. W. Gladwell, Surveyor's Office, High-street, Walton-on-Naze	Feb. 25
Street Works (Green-lanes, West-street, etc.)	do.	do.	do.
Making-up Ayton-road, etc.	Ramsgate Corporation	T. G. Taylor, Borough Surveyor, Albion House, Ramsgate	do.
*Annual Contracts	Islington Borough Council	Town Hall, Upper-street, N.	do.
*Road Material, Stores, Forage, Horse Hire, &c.	Woolwich Borough Council	Borough Engineer, Muxey-road, Plumstead	do.
*Farm Buildings, Talgarth	Brecon and Radnor Asylum	Giles, Gough & Trollope, 28, Craven-street, Charing Cross	Feb. 26
*Pair of Semi-Detached Cottages, Talgarth	do.	The Clerk, at Asylum, Talgarth, R.S.O.	do.
Curved Girder Roof, Granton	Gas Coms., Edin. & Leith Corps.	W. R. Herring, M.Inst.C.E., Chief Engineer and Manager	Feb. 29
Ordinary Roofs, etc., Granton	do.	do.	do.
Thorner Sewerage and Sewage Disposal	Wetherby R.D.C.	Richardson & Hartley, Engineers, East Parade-chambers, Leeds	do.
*12,000 Tons 2 in. Blue Guernsey Granite, etc.	Middlesex County Council	County Engineer and Surveyor, Middlesex Guildhall	Mar. 1
*Cartage of Materials	do.	do.	do.
*Municipal Offices and other Buildings	Tottenham U.D.C.	Council's Engineer, 712, High-road, Tottenham	do.
*Light Railways	Middlesex County Council	County Engineer, Middlesex Guildhall, Westminster	do.
3,400 Lineal Yards of Sewers, Headcorn, Kent	Hollinbourn R.D.C.	Fairbank & Son, C.E., Lendal-chambers, York	Mar. 2
*Children's Homes, Schools, etc., Hutton, Essex	Poplar Union	J. R. Hunt & Co., 181, Queen Victoria-street, E.C.	Mar. 4
*Electric Power Transmission Scheme Buildings	Birmingham Dis. Board and Corp.	J. D. Watson, Engineer, Tyburn, near Birmingham	Mar. 7
Conveyance of Ammoniacal Liquor	Manchester Corp. Gas Com.	C. Vickson, Gas Department, Town Hall, Manchester	Mar. 24
Coaling Plant for Port Natal	Government of Natal	Agent-General, 26, Victoria-street, Westminster, S.W.	Mar. 25
*Fitting-up Kitchens, New W'kh'se, Wormw'd Scrubbs	Hammersmith Guardians	Giles, Gough, & Trollope, Archs., 28, Craven-st., Charing Cross, W.C.	No date
*Fitting-up Laundry, New W'khse, Wormwood Scrubbs	do.	do.	do.
Seating of Battery of Water Tube Boilers	.....	Manager, Bettisfield Colliery Company, Ltd., Bagillt, Flintshire	do.
Excavating, etc., Two Boiler Feed Ponds	.....	do.	do.
Alterations to Seawfell Hotel, Seascale	Executors of J. Tyson	Oliver & Dodgshun, Architects, Carlisle	do.
Dining-room, etc., at Hostel, Barnard's Cross	Salisbury Diocesan Training Coll.	J. Harding & Son, Architects, 58, High-street, Salisbury	do.
Road, 700 Yards Long, Silkestone	.....	Estate Office, Silkstone	do.
Thirteen Dwelling Houses, Stranmillis	.....	R. A. Boyd, Architect, 22, Lombard-street, Belfast	do.
Schools, Springwell, near Gateshead	Usworth School Board	S. Wilkinson, Architect, 30, Mosley-street, Newcastle-on-Tyne	do.
Pitch and Creosote Oil for Paving Committee	Manchester Corporation	Chief Clerk, Highways Department, Town Hall, Manchester	do.
Stores	Directors, Mersey Railway Co.	G. H. Langham, Secretary, Worcester House, Walbrook, E.C.	do.
Electric Light, W'km'n's Club & Inst., Ushaw Moor.	The Workmen's Club, Ltd.	J. Gates, Whitworth House, Station-road, Ushaw Moor, Durham.	do.
One Shop & Two Houses, Church-st., Llantwit Major	.....	Old White Hart, Llantwit Major	do.
*Two Locomotives, Waterside Station, Londonderry	Donegal Ry. Co.	Loco. Superintendent, Stranorlar Station, co. Donegal	do.
*New Schools, Stockingford, Nuneaton	Nuneaton, etc., U.D.C.	H. Quick, Architect, 64, Hertford-street, Coventry	do.
*Sundry Works to Complete Six Houses, Finchley	.....	R. J. Tasker, 28, John-street, Bedford-row, W.C.	do.

PUBLIC APPOINTMENTS.

Nature of Appointment.	By whom Advertised.	Salary.	Tenders to be delivered
*Engineering Assistant	Burnley Corporation	117*l.*	Feb. 10
*Quantity Surveyor	do.	2*l.* 2s. per week	do.
Sewerage Assistant	Leicester Coporation	120*l.*	do.
*Clerk of Works	Harrogate Corporation	3*l.* per week	Feb. 13
Surveyor	Sutton-in-Ashfield U.D.C.	150*l.*	Feb. 20
*Architectural Draughtsman, Portland	Works Dept., Admiralty	Not stated	No date

Those marked with an asterisk (*) are advertised in this Number. *Competitions*, iv. *Contracts*, iv. vi. viii. x. *Public Appointments*, xviii.

TENDERS—*Continued from page* 151.

SOUTH SHIELDS.—For new biscuit factory and warehouse, caretaker's house, cooperage, washing-sheds, etc., at Tyne Dock, for Mr. H. Wright. Mr. F. Rennoldson, architect, 37, King-street, South Shields. Quantities by the architect:—

R. M. Storey	£17,232 9 11
G. O. Gillespby	16,978 10 9
T. Lumsden	16,920 0 0
W. J. Robertson & Sons	16,120 0 0
G. Thornton & Co.	16,042 13 4
Glen & Moffett	15,968 19 0
W. D. Allison	15,694 5 1
James Young	15,652 14 5
Alexander Ross	15,491 14 3
R. Summerbell & Sons	15,322 0 0
J. Moore	15,219 13 6
W. T. Weir	15,159 0 0
Wm. Kennedy	14,975 0 0
J. C. Nichol	14,706 10 7
S. F. Davidson	14,584 0 0
Wm. Forster	14,320 0 0
S. Sheriff & Sons*	14,276 8 4

WALSALL.—For paving works in Queen-street, Palfrey, for the Corporation. Mr. R. H. Middleton, Borough Surveyor, Walsall:—
James Owens, Wolverhampton* .. £639 2 0

WALTHAMSTOW.—For corrugated iron shed and inclined roadway, for the Walthamstow Urban District Council. Mr. G. W. Holmes, Engineer, Town Hall, Walthamstow:—

Baker & Co.	£2,200	Rowlingson	£1,640
W. E. Wood	1,901	Braby & Co.	1,571
Dierson & Co.	1,805	Cross & Cross	1,495
Westwood & Co.	1,770	Norton Bros.	1,410
Brownlie, Murray, & Co.	1,689	Wood & Co.	1,389
		Smith & Co.*	1,354

Inclined Roadway (Builder's Work):

A. T. Catley	450	W. Manders*	420

WALTHAMSTOW.—For the erection of bridges, for the Walthamstow Urban District Council. Mr. G. W. Holmes, Engineer, Town Hall, Walthamstow:—

	Dagenham Brook Bridge Widening.	Water Works River Bridge.	Blackhorse Lane Bridge Widening.	Ching Bridge.
A. T. Catley	£250*	£800*	£870*	£650*
A. Fasey	258	1,169	920	745
Wilkinson Bros.	296	904	1,071	714
D. R. Paterson	350	2,200	1,230	900
G. Bell	397	1,119	1,169	897
M. Dinnie	433	1,097	1,058	—
W. Manders	440	1,550	1,480	1,003
J. A. Reed	—	—	938	704
A. Dixon & Co.	—	—	—	800

WALTHAMSTOW.—For the erection of a new shop in Higham Hill-road, for Mr. C. J. Geary. Messrs. Selby & Kislingbury, architects, 44, Chancery-lane:—

J. V. Riddle & Son	£797 0 0
Stewart & Co.	453 0 0
J. Abbott (amended)*	380 0 0

WARRINGTON.—For one year's supply of earthenware ducts for drawing-in of mains, for Electricity and Tramways Committee of Corporation. Mr. W. H. Grimsdale, Borough Electrical Engineer, Howley, Warrington:—
Albion Clay Co. Ltd.* (schedule of prices).

WIILENHALL (Staffs.).—For road works, Back-lane, for the Urban District Council. Mr. T. E. Fellows, C.E., Engineer, Town Hall, Willenhall. Quantities by Engineer:—

R. W. Fitzmaurice & Co.	£467 14 10
Herbert Holloway	443 16 0
Currall, Lewis, & Martin	435 6 0
W. H. Reading	424 0 0
James Owens	389 9 6
George Holloway, Wolverhampton*	375 0 0

WILLENHALL (Staffs).—For 1,750 yards of stone kerbing and sett channelling, Bilston main road, for the Urban District Council. Mr. T. E. Fellows, C.E., Engineer and Surveyor, Town Hall, Willenhall. Quantities by Engineer:—

Herbert Holloway	£682 7 0
John Gott	666 17 [illegible]
George Holloway	623 9 0
R. W. Fitzmaurice & Co.	616 1 9
Currall, Lewis, & Martin	601 7 3
W. H. Reading	600 0 0
James Owens, Wolverhampton*	597 13 7

WIMBLEDON.—For making-up Arthur-road, Home Park-road, and Landgrove-road, for the Urban District Council. Mr. C. H. Cooper, M.Inst.C.E., Council Offices, Broadway, Wimbledon:—

J. Mowlem & Co., Westminster, S.W.*	£1,989 0 0 Arthur-rd. (Sect. 3) 833 0 0 Arthur-rd. (Sect. 5) 451 0 0 Landgrove-road
E. Iles, North-road, Wimbledon*	£876 0 0 Arthur-road (Sect. 4) 717 0 0 Home Park-rd. (Sect. 3)

TO CORRESPONDENTS.

J. H. M. (Next week). —H. F. H. (MS. received).

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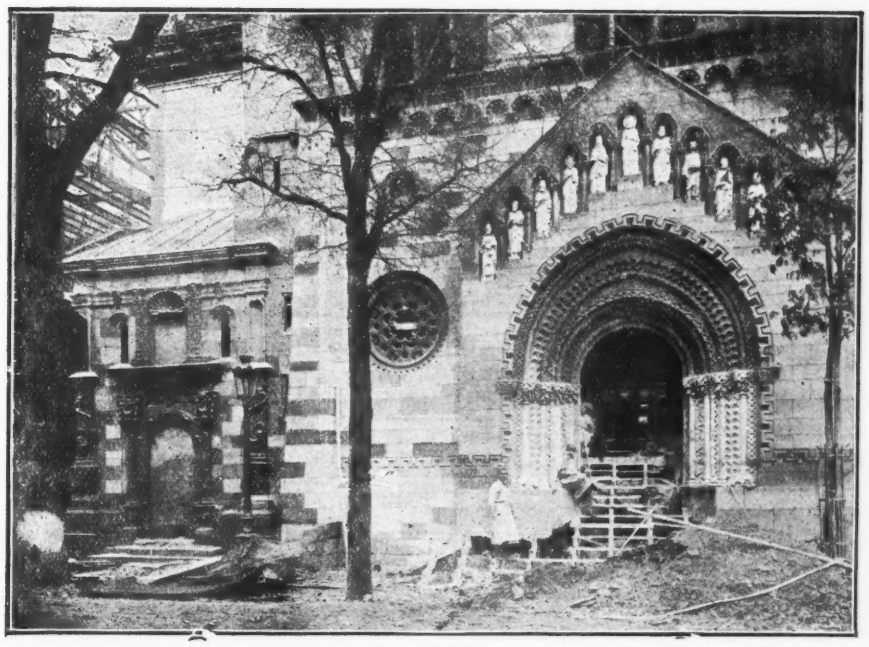

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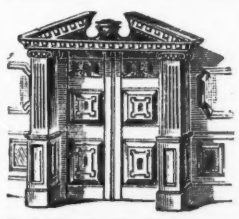

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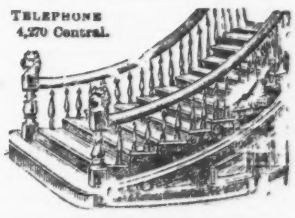

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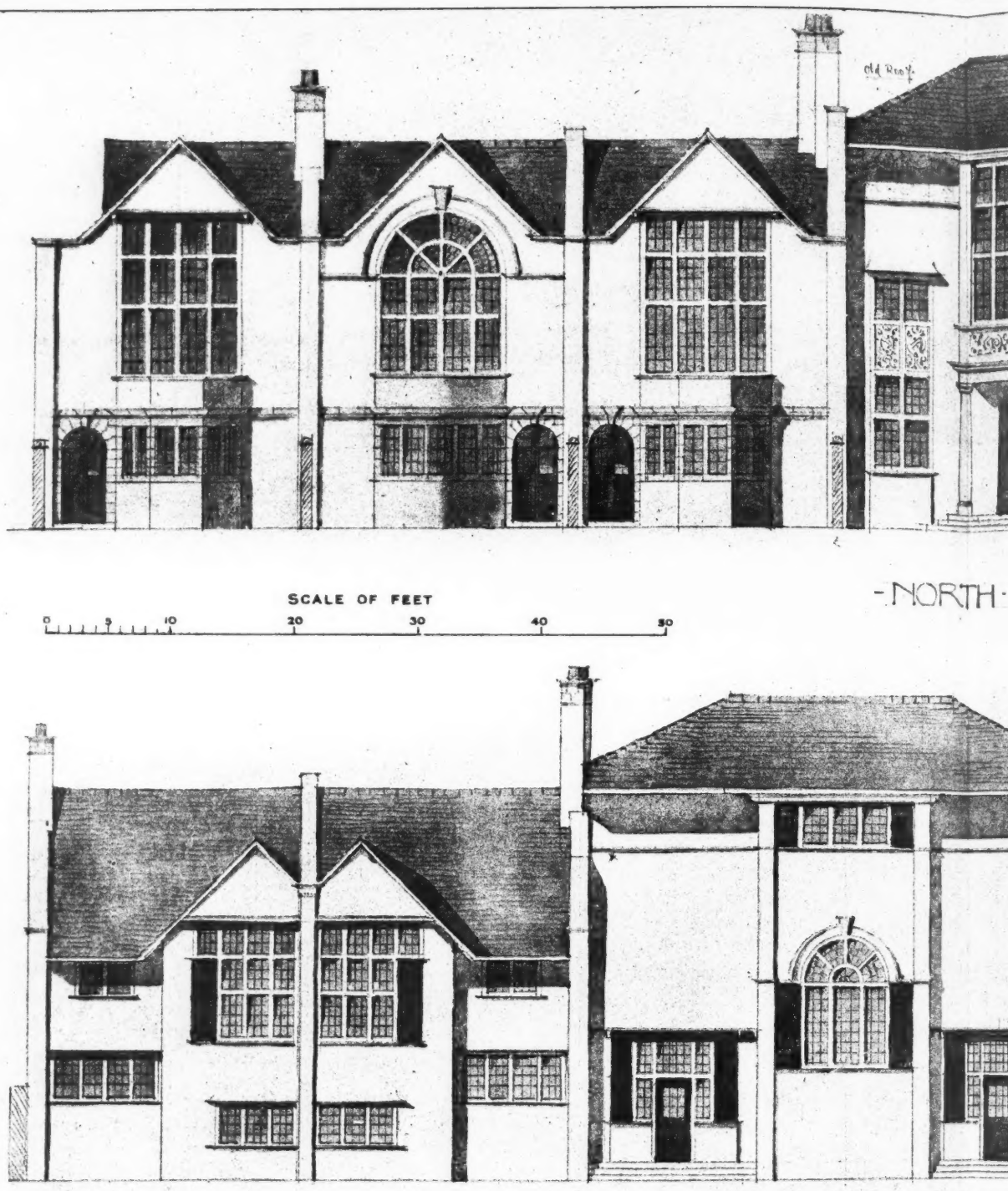

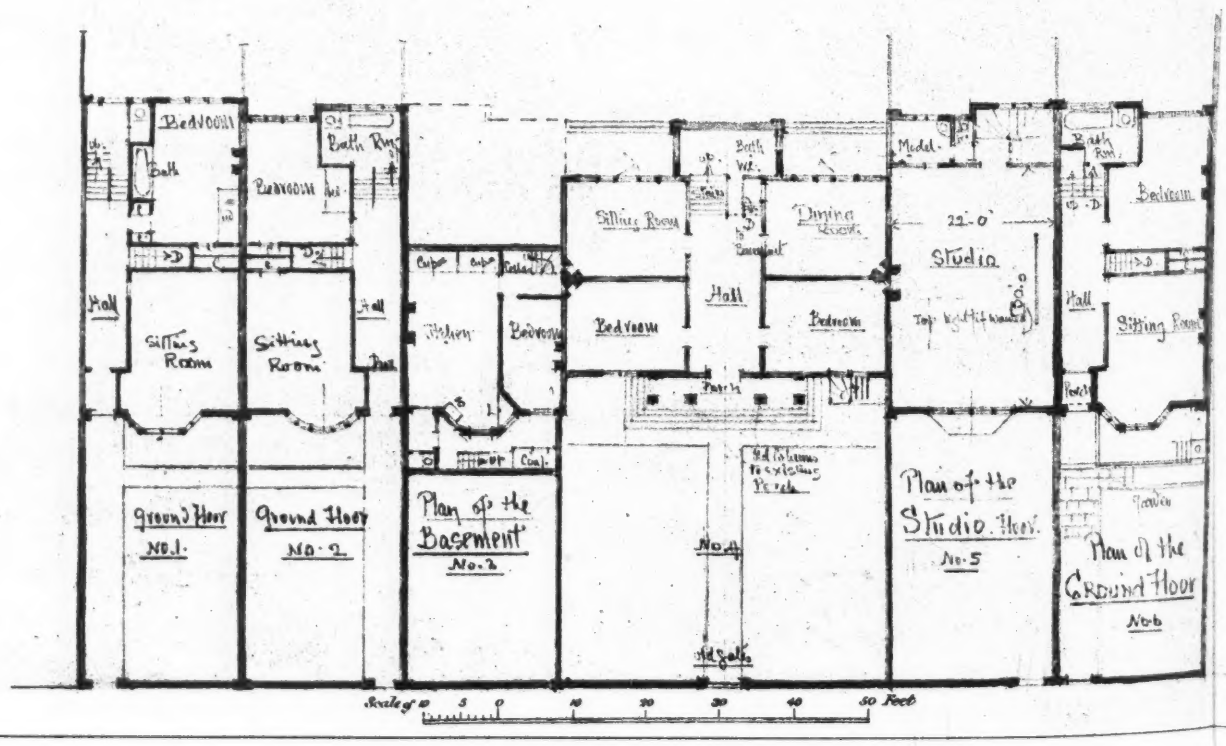

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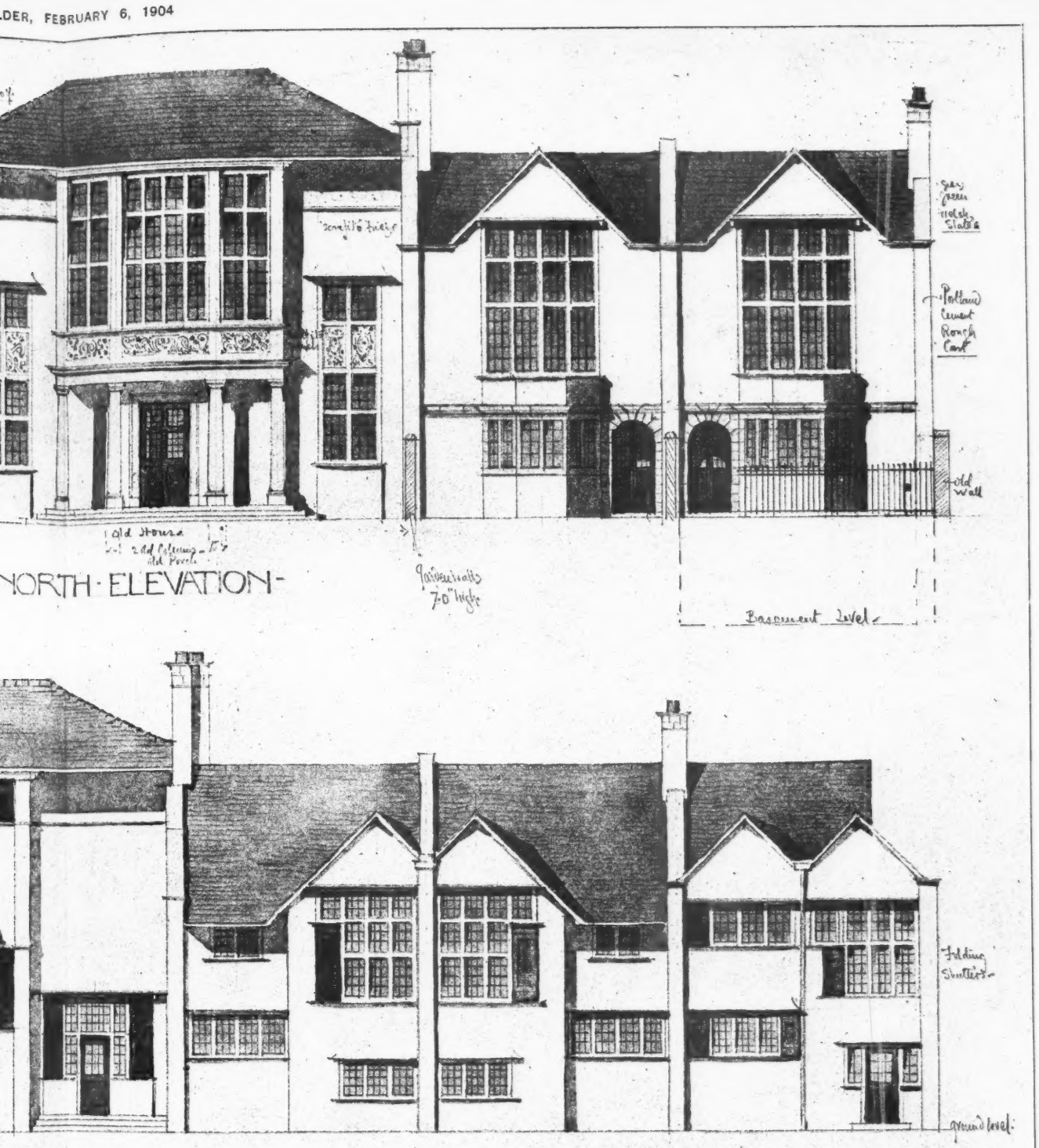

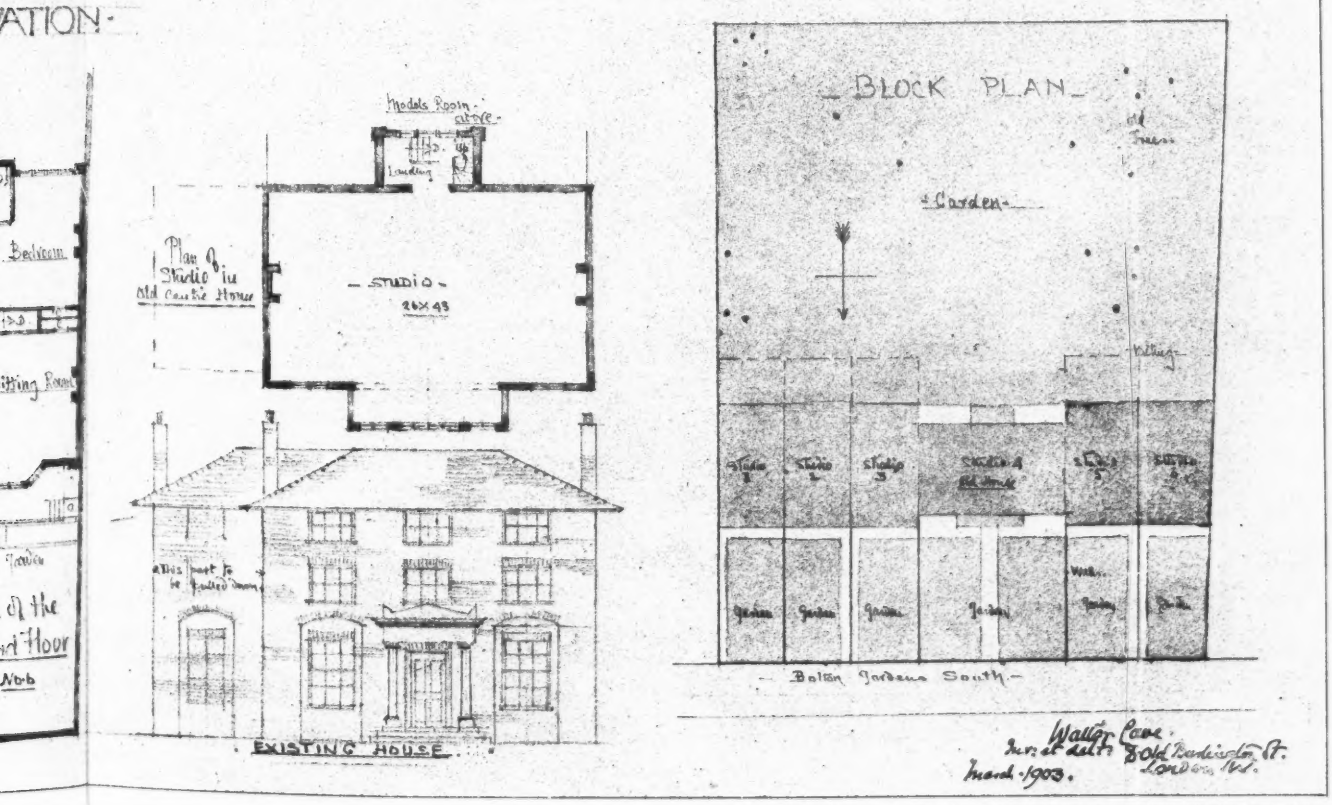

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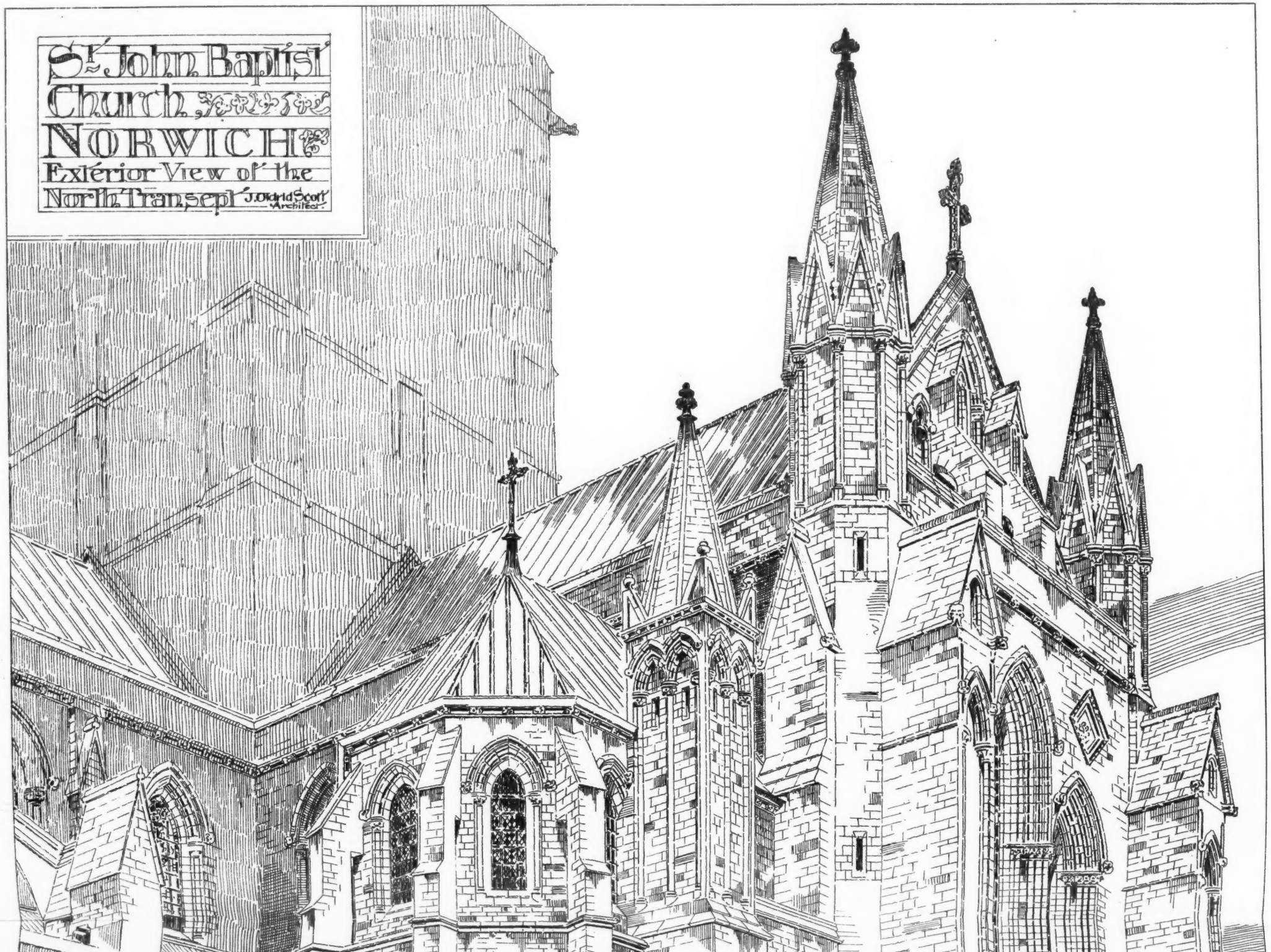

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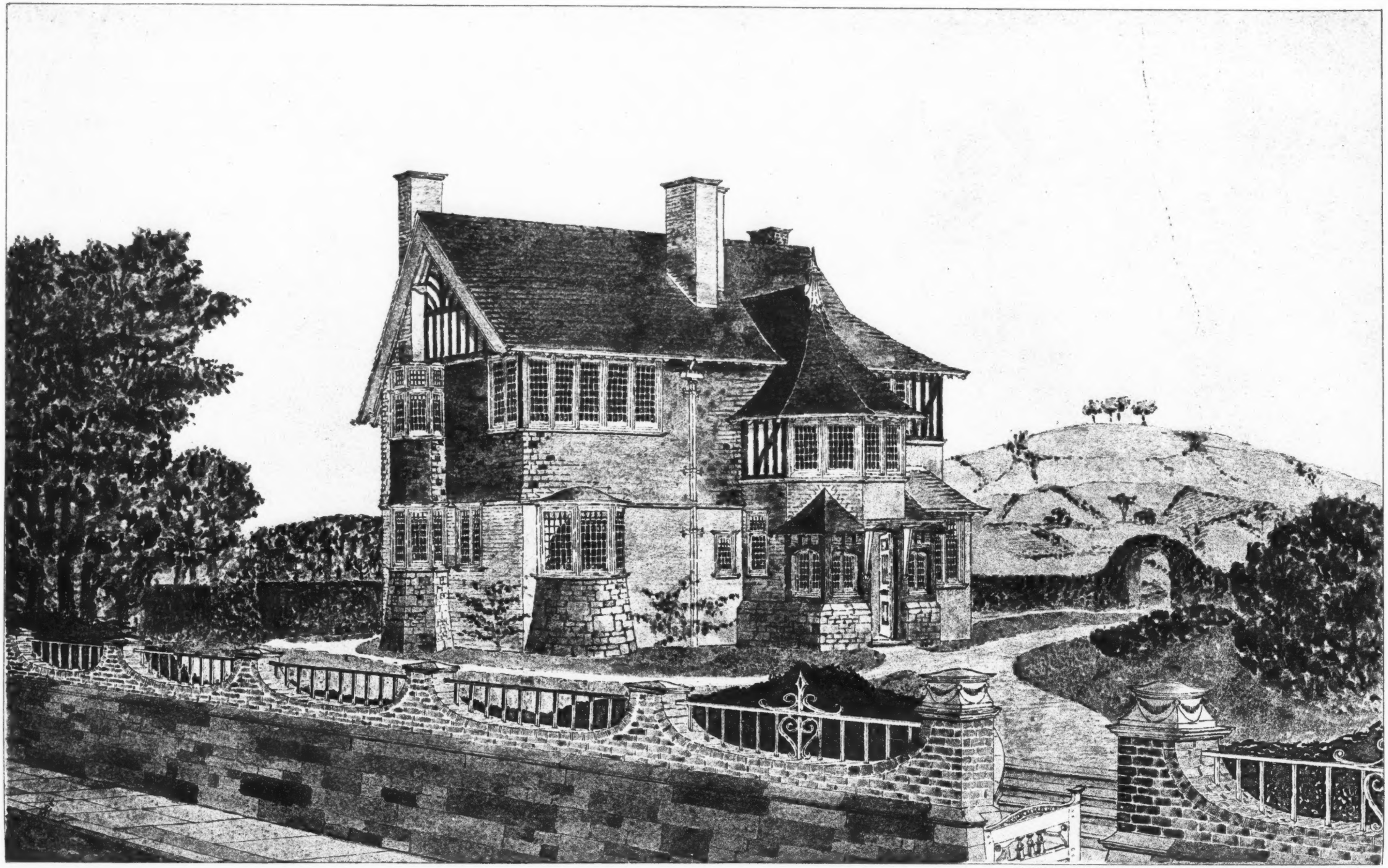

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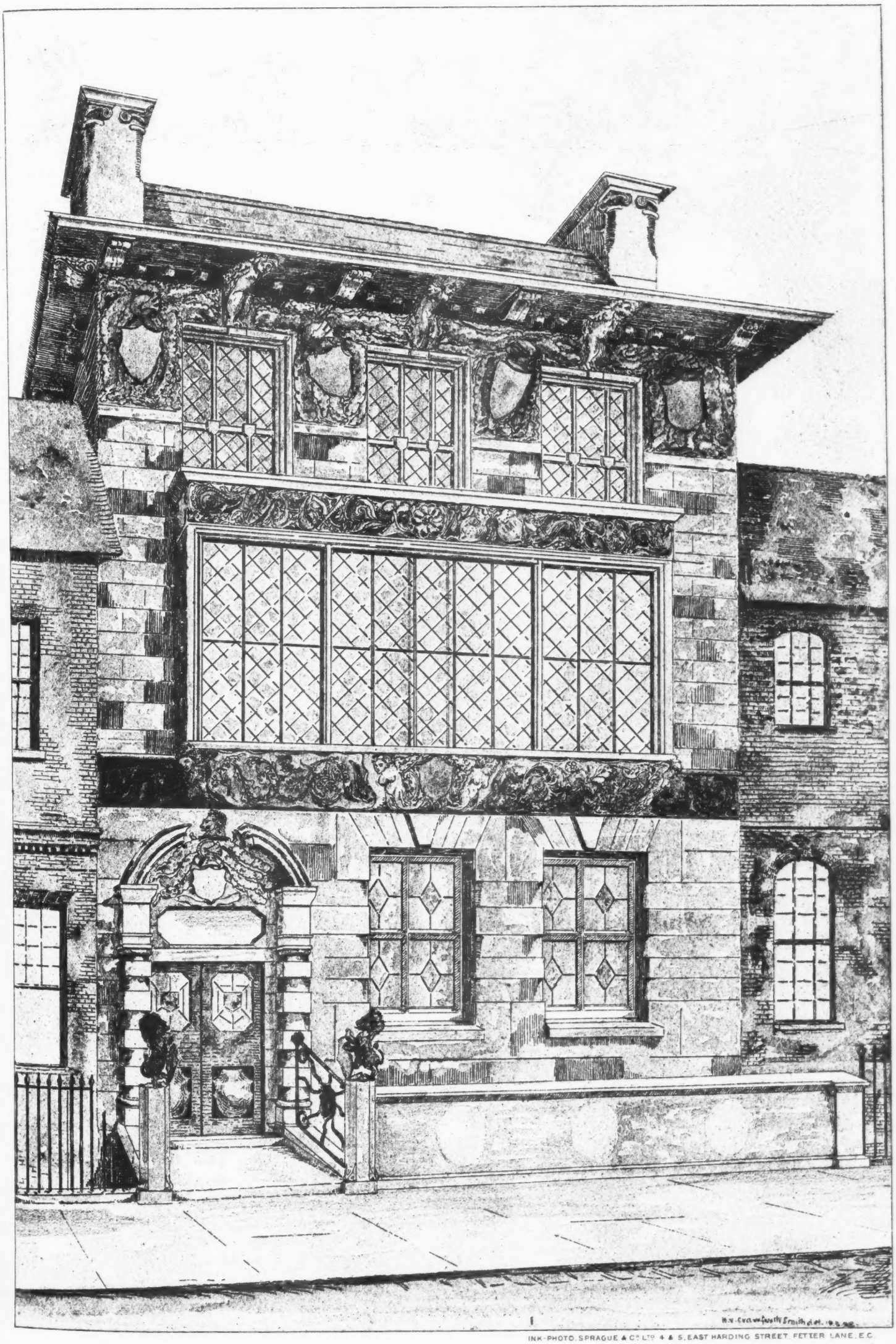

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